FEBRUARY 25 CENTS

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG'D. TRADE MARK, GREAT BRITAIN, No. 402458 REG. U.S. PAT. OFF.

The Battle of the Giants

SEE PAGE 182



HOW MUCH DO YOU REALLY SEE?

See Page 248

This Wonderful VIX Engine Humidifier Invention Will Give Your Auto a Completely New All Around Performance in 30 Minutes

New Pickup

No matter how quick your pickup may now be—this VIX Humidifier will positively make it quicker. Your engine will flash ahead with the slightest touch of the accelerator pedal. Your car will scoot around others with amazing alertness and complete safety in and out of traffic.

New Power

This VIX Humidifier improves the power of any engine to approximately the equivalent of another cylinder added. You can fly over hills, in high, that you always changed gears on before. A scientific humidifying treatment of the engine fuel does it.

New Speed

This VIX humidifying process gives the engine more speed. Your car will be faster, with lightning-flash acceleration, in passing other cars, and top speed increased several miles per hour. A new top speed for every engine, from a Ford to a Rolls-Royce.

New Smoothness

Glasslike smoothness—less vibration at both low and high speed—the purr of the engine is made less audible than the swish of engine speed. This VIX invention makes the motor run softer, with quieter valves and tappets, and a cushioned explosion that gives you the utmost in vibrationless driving comfort.

New Mileage

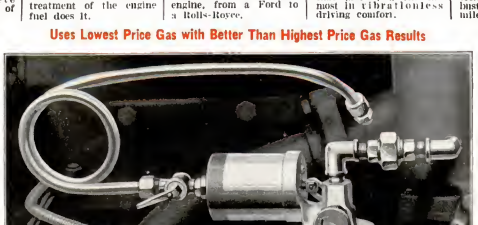
This is not a joke gas saver. But scientific engine humidification DOES GIVE more mileage. Gains up to 30%, 40%, and 50% are regularly reported. The average gain for all cars is 20% minimum. Humidifying the auto engine effects more perfect combustion, and a NEW mileage is attained.

An Auto Engine Humidifier

▼

Its Function Is The Same That Makes Autos Run The Wonderful Way They Do In The Cool Damp Evening Air Or In Foggy Or Rainy Weather

Uses Lowest Price Gas with Better Than Highest Price Gas Results



Not A Joke Gas Saver

▼

Nothing Else Like It The World Over—Now Or Ever Before

—

Fits All Autos Any Average Handy Man Can Install In 30 Minutes

An Engineering Achievement of Outstanding Importance

PATENTED AND TRADE-MARKED IN 109 NATIONS

Decarbonizes Engine—Saves Carbon-Caused Repair Bills

When you drive down the road at night, many times you notice a car ahead of you belching red-hot sparks from the exhaust outlet pipe. That's because the moisture from the atmosphere taken into the engine through the carburetor is disintegrating the hard carbon, and it is coming out of the exhaust in red-hot sparks.

This VIX Humidifier invention scientifically sends a constant stream of moisture into the engine, all the time, which completely decarbonizes the engine and keeps it clean, everlastingly.

Ends carbon knocks, stops engine overheating, cures sticky valves, lubricates cylinders, kills carbon monoxide gas, and the expense of frequent valve grinding and spark plug cleaning. Everyone knows the average car owner spends all the way from $25.00 to $100.00 a year in engine repairs, due to the bad effects of hard carbon. The VIX saves all carbon-caused repair bills. Fits every auto, truck—is easily attached—works alike, winter and summer—is easily changed from one car to another. Mail coupon below or postal request.

Pays Agents Big Quick Cash Profits

Choice Territory available. I want to appoint County, State, Province, National, Salesman and Distributor, and General Agencies to make $250.00 to $1,500.00 month, filling the great demand bound to arise for this wonderful invention wherever introduced. One Distributor already made profits of $4,939.66 in 3-¾ months. BIG MONEY can be made FITTING Engines with VIX. Startling, stunning, convincing demonstrations make sales EASY. Write quick for all details; full proof, ALL SENT FREE. Mail FREE VIX Offer Coupon TODAY. Or send postal.

Gives Substantial Mileage Gain Pays For Itself Over and Over Each Year

By a scientific process of mixing humidified air or vapor moisture with engine fuel, this VIX invention brings about more perfect combustion. This better combustion gives a much smoother running engine, with far greater power, vastly quicker acceleration (pickup), and several miles per hour more top speed. Like coal burns better when it is sprinkled with water before thrown into the fire, so does this process of mixing moisture with engine fuel make the fuel burn up more completely. Thus you get more miles per gallon of gas and oil.

Remarkable mileage gains have been reported to us, up to as high as 100%. The average gain for all cars reported to us is 20%. The function of this VIX Humidifier permits the use of lowest priced gas, with better than highest priced gas results. That means a saving of from 3c to 5c a gallon every time you fill your gas tank. The doing away with carbon-caused repair bills. The money saved in cheaper gas, plus mileage gain, pays for this VIX Humidifier invention over and over again every year.

The Inventor and Manufacturer will furnish at his risk, direct from Factory, a suitable VIX Model on trial for you to try out on your own Car.

Fill out and mail the coupon QUICK for full details and FREE VIX offer. Or send postal request. ALL SENT FREE.

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Inventor and Manufacturer
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Three Chicago food experts invent a delightful ***new*** *food that is revolutionizing the doughnut business.*

Here's an Amazing New Business That Pays Up to.... $1,000 a Month

Here is a surprising new opportunity. Now you can immediately become the owner of a big business that is paying others from $75 up to $250 a week. There is no "Red Tape"— no delay. Wherever you live there are quick, easy profits waiting for you to grab them. Just mail the coupon for full details.

Individual Plans to Fit Every Need

FULL TIME

You can start a Brown Bobby shop with floor space as little as 6 by 6 feet. Sell retail and wholesale.

Thos. Minch, Fla., made $3,000 his first 3 months.

PART TIME

Invest a few dollars in this new business and get someone else to run it for you. A few hours of your time each week can easily bring you $50 up to $150 a week extra cash.

SPARE TIME

Start at home. Make money like Mrs. Nelson, Ill., who sold 90 dozen Brown Bobbys at retail in one week, then went out to triple her profits through wholesale business.

MEN, this is absolutely new! A real red-hot money-making opportunity! Something every red-blooded man has always longed for. It's a chance to jump into business for yourself and make more money every week than the average man makes in a month!

Surprising, yes, almost incredible as it may sound, we actually start you in a **proven business!** The first day's profits often run from $18 to $55—and a business of $350 to $600 the first month is not exceptional for ambitious men or women.

A Sensational Big-Money Plan

There is just one thing you need to make a "go" of this business, and that is the ambition to make real money. We give you all the plans, advice and help needed to make a big success right from the jump. We supply you with the equipment to make an amazing new food—a **greaseless** doughnut baked by electricity! You sell to homes, bakeries, delicatessens, groceries, restaurants, etc., at a profit of 150% to 600%! No wonder the dollars simply pour in!

A New Food Secret

The **greaseless** doughnut is altogether novel and unique. It's a crispy, flaky, delicious new kind of doughnut cooked without one drop of oil or grease. Easily digested by everyone. More appetizing than old-style doughnuts ever were. Yet costs you less to make. This new business is copyrighted under the trade name "BROWN BOBBY," so there is no competition.

Everyone likes doughnuts. Millions of old-style doughnuts are sold every day. Now you can bake and sell the perfect doughnut—the toothsome BROWN BOBBY **greaseless** doughnut that sells four times as fast as any other.

Start At Once—Anywhere

In this limited space I am able to suggest only the bare possibilities. The details are even more sensational than the facts given here can indicate. I am looking for sincere, ambitious, wide-awake men. I offer such men a plan that is a real eye-opener. The first week's profits usually amount to more than your entire investment. After that it is up to you entirely whether you will make $300 or $1,000 a month clear profit.

Men and women start in this business daily. You do not obligate yourself in any way by mailing the attached coupon. So get the details of this amazing new idea at once. Decide for independence! Fill out and mail the coupon today—**now**—THIS MINUTE!

This One

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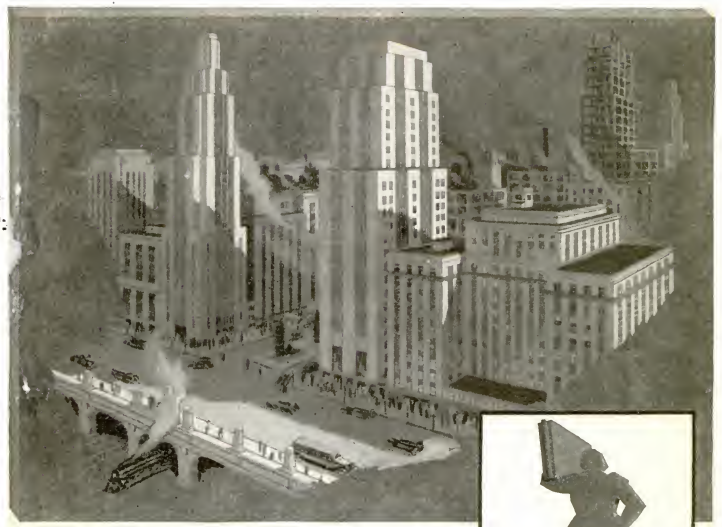
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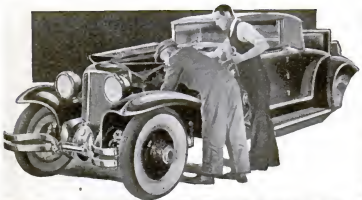
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The New DEALER SERVICE

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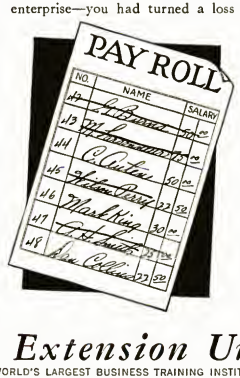
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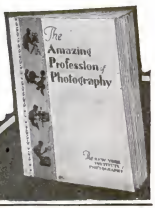
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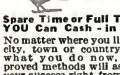
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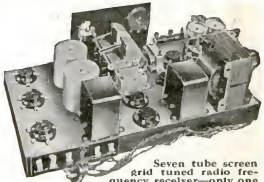
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I'VE only been selling about a year. When I broke in, though I realized that trained salesmen are the highest paid men in the world, I expected the going to be hard at first. It was—a lot harder than I'd expected, even. At the end of six months I was commencing to get discouraged. I certainly hadn't made a flop of it—but I wasn't getting the results I should have had.

Naturally, seeing other fellows who started right with me go right ahead, I realized something was wrong. A particularly disheartening thing was the fact that at times I'd be right on the point of closing a good-sized order—and all of a sudden, it would go "flop." In fact, it kept happening all the time. I was doing something, I knew, that was killing those sales.

Finally I decided that I had to do something. I had been hearing a lot about National Salesmen's Training Association. But I'd never investigated them. Then, one day, I read one of their announcements. I was amazed to find how comprehensively they covered the training of salesmen. Furthermore, they announced that they were sending a most unusual volume, "The Key to Master Salesmanship," to ambitious men who asked for it—not only experienced salesmen, but men who had never sold, but wanted a chance in this highly paid field.

Naturally, I wrote for it—it seemed to me that here was the certain solution to the errors I had been making. Imagine my surprise—and interest—when there arrived, not only one book but two. To this day I can't decide which of those books helped me most. The little book which I had not been expecting was just what I needed at the time. It was written for men just like me—men who had been plugging along in salesmanship—never successful, never hopeless that they quit selling. And while "The Key to Master Salesmanship" gave me an insight into the real secrets of salesmanship, the other book, "Mistakes Commonly Made in Selling," was the one I could first get practical use from.



Right in the first few pages, I saw some examples quoted. They were things I had been doing every day. I'd never dreamed they were dangerous errors. The more I thought about them, the more clear it became, though, why I was having such difficulty with my closes. I thought to myself: "By golly, that's why Barnes decided to put off buying, this very afternoon!" I kept on thinking of men whose orders I had lost, through just that very mistake. There were six of them.

The next morning I sallied out, bright and early to see if I couldn't save those sales, using the tips given me. Before noon, I had put the practical suggestions of that little book to work—and sure enough, in every case, I made the sale which I had thought was gone glimmering. Six sales saved—at $15 commission apiece, that was $90 made, by one morning's work, plus the advice of a little book that cost me nothing!

Of course, that set me to thinking. If that one piece of knowledge could make me $90, how much would I make out of having all the knowledge which the National Salesmen's Training Association could give me? It didn't take long to figure that one out, either! I was enrolled for the full training that same night; and the next two weeks saw my sales record soar. Not a minute of time lost—I studied just in spare hours but I learned things in those spare hours that I'd never have picked up, just by my own experience.

Today, I find amazing increase in the volume of my sales now over what they were a year ago. Then I was selling only about 40% of my quota—this month, with a quota twice as high as it used to be, I'm 50% over! And you know what quantity production means when the bonus checks roll around!

Today any man who wants to see how to end some of his biggest sales weaknesses can learn from this book some of the most frequent mistakes which spoil sales, and get practical suggestions how to end them. Not a penny of obligation—"Mistakes Commonly Made in Selling" is now FREE to any ambitious man. At the same time we will send you, also free, the new and finer edition of "The Key to Master Salesmanship," which since its publication has been read by many men who have got into the biggest pay class of salesmanship. Write for both these valuable volumes now—the coupon will bring them by return mail.

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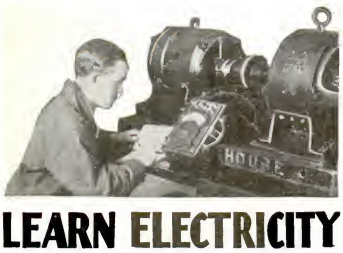
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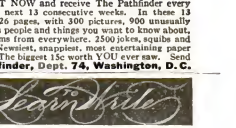
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Yet somehow I couldn't make friends. I'd be invited out occasionally but these occasions were few and far between. I must have been considered a wet blanket at parties. You see, all the other guests were able to do their share toward making things lively by entertaining in one way or another. But I was able to contribute nothing. . . . No wonder they didn't invite me often!

But that was before Bob took me in hand. Bob played the piano marvelously well—and I loved to listen to him.

One evening I commented on his ability to play. He turned to me and said: "Why don't you learn to play? In your spare time, I mean."

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I must have looked my astonishment, for he continued:

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"What!" I exclaimed. "Why, I thought it took *forever* to learn to play. All those scales and exercises. . . . Besides, it's too expensive."

"Nonsense!" Bob laughed. "I'll tell you how *I* learned. You think I play pretty well, don't you?" I nodded. "Well, I *taught myself* to play. Right in this room. Without a teacher. And say, it didn't cost a fraction of what those old-fashioned, slow methods do!"

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From then on my playing has steadily improved, until now I can play anything my friends ask me to. Yes—I have plenty of friends now—thanks to my new found ability to entertain at the piano! Every minute of my spare time is now in demand—parties, entertainments, friends and fun. That's living!

* * * * *

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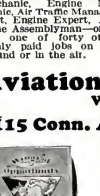
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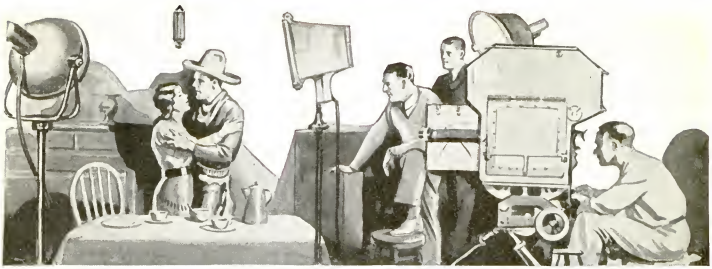
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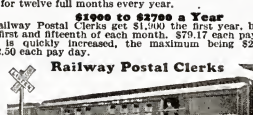
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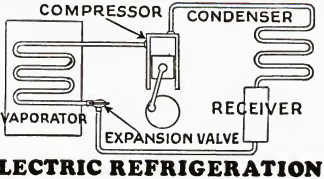
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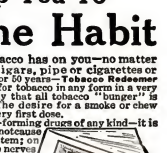
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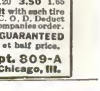
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REPLATE Brassy worn-off automobile parts, reflectors, bath room fixtures, worn chromium, stoves, tableware, etc. Looks like new. Use U-Kan-Plate Polish. Positively no mercury; $1.00 half pints. Postpaid. Satisfaction guaranteed. Agents wanted. Dept. A, U-Kan-Plate Co., Philadelphia.

SELL. Goodyear raincoats, $2.95 up. Goodyear Rainwear, 18 West 22nd, New York.

SOMETHING The housewives want. A signed guarantee to save money and time in cooking. No competition. 400% profit. No license required. Station C, Box 258, San Diego, Calif.

AGENTS—Engraved name plates, signs, number plates etc., steadily sold with large profits. Brett Bros., Winthrop, Mass.

NEW Line Counter Displays, Aspirin, Flints, Chewing Laxative, Breath Gum, Notarize, Stickers. Steady Repeats, Over 100% Profit. Superba Co., W5, Baltimore, Md.

THIS Advertisement may make you thousands of dollars, if you write immediately for my "Eye-Opening" literature describing guaranteed formulas; valuable trade processes, moneymaking information how to easily make the world's best-selling specialties. All lines. Immense profits. Repeats immense! Start in your home, room or office. Make the most good-will-producing line. Dr. Lisomde Miller, Chemist, Tampa, Fla.

WE Start you without a dollar. Soaps, extracts, perfumes, toilet goods. Experience unnecessary. Carnation Co., 641, St. Louis, Mo.

FLAVORING Extracts—Bottle yourself! Labels furnished. 900% profits. Whirlwind money-makers! Repeaters! Free offer. Thomas Manufacturing Company, Indianapolis, Ind.

CALIFORNIA Perfumed beads, selling like hot cakes. Agents coining money. Catalog free. Mission Factory, F, 2328W Pico, Los Angeles, Calif.

MAIL Order house wants ambitious men everywhere to mail circulars, appoint agents, fill orders. Experience unnecessary. Good pay. International Laboratories, 162-A N. State, Chicago.

SELL Men's neckwear—wonderful proposition. Astor-M, 39 East 28th, N. Y.

SUCCEED With your own products. Make-sell them yourself. Formulas, processes, trade-secrets. Expert analytical service. Catalog free. B. Thaxly Co., Washington, D. C.

HIGH-GRADE SALESMEN WANTED

BEST Direct seller. California grape wine brick, all flavors (port, sherry, champagne, Burgundy, etc. One brick makes one gallon of juice. To prevent fermentation, add 1/10% benzoate of soda. For home use only. Every grocer, druggist, soft-drink place, every home, hospital, physician interested. Take orders, give service and build up steady trade. 100% and more profit if bought outright. 50% commission to salesmen. Beware of imitations, flooding the market since our original grape brick received nationwide publicity. In business for 10 years. No competitive brick older than ten weeks. Vino Sano Co., Dept., S-231, San Francisco, Calif.

LOCAL County manager to exploit existing business in use and demonstrate new patented device for schools, homes, stores, shops, garages, churches, warehouses, trucks, autos and busses. Your men are earning from $35 to $50 weekly on service work alone in addition to profits on sale of new equipment. Lifetime job for man who are reliable and ambitious to build up steady business. Successful men earn from $3,500 up to $10,000 a year. Factory manufacturer with "A-1" rating. The Fyr-Fyter Co., Dept. 2, Fyr-Fyter Bldg., Dayton, Ohio.

DON'T Be a job hunter—start your own city business on our capital; no hard times, no lay-offs, your own boss; hundreds average $3,000 annual sales year after year; we supply stocks, equipment on credit; some $50 home necessities; selling experience unnecessary; wonderful opportunity to own pleasant, dignified, profitable business backed by $17,000,000 world-wide industry; for complete information write Rawleigh Co., Dept. B-U-PPM, Freeport, Ill.

SALESMEN—Go in business for yourself—experience unnecessary. Average $120.00 monthly selling only one $10.00 accident-sickness policy daily. Policy pays $100.00 principal and $25.00 weekly benefit. Steady income from renewals—$100,000 deposited with state. Leader furnished. National advertising campaign. Write quickly for territory and special contract. North American Accident Insurance Company, 303 Wallach Bldg., Newark, N. J.

APLENTY New and different—Fast selling 5c and 10c merchandise on attractive counter cards. 100% coin. To jobbers and dealers. Advertised by radio. No investment required. Catalog free. Estab. 1921. World's Products, 187 Central, Spencer, Ind.

MANUFACTURER Wants local representative fine shirts, ties, underwear, hosiery; exceptional values, maker to maker, large earnings daily. Extra cash bonuses regularly. Free shirt, tie. We start you without investment. Splendid success. Extensive outfit free. Write Dept. K2, Rosecliff, 1237 Broadway, New York.

$18 TO $40 Daily; biggest selling line of men's suits. Meets present day conditions. Amazing values at $11.95, $14.50, $16.95, $18.95. Also raincoats, sheepskin jackets and boys' suits. Biggest commission paid in advance. Liberal bonus. Free outfit. State age and selling experience. Earl-Tyler, Inc., Dept, 22, 2250 South Spaulding Ave., Chicago.

WELLS Gold pictures are new, different, beautiful. We make large sizes from customers' pictures. Profitable steady sales opportunities anywhere. Wells Studio, Cleveland, Ohio.

LET Me pay you up to $75 a week, selling my all-wool, guaranteed-to-measure tailored prices in 20 years. Now $19.50 and up. Big free outfit puts you in business. Write now. W. Z. Gibson, Inc., 500 Throop St., Dept. P-317, Chicago.

SALESMEN Represent manufacturer direct to wearer; guaranteed all wool suits, topcoats, $18.80. You can make $5.00 an order. Fabrics from America's finest mills. Satisfaction guaranteed. Outfit free. Write your experience. All Wool, Dept. P2, 890 B'way, New York City.

SALESMEN, 100% Profit. Represent manufacturer direct. Box 141, Ocean City, N. J.

ADVERTISING Salesmen for established line syndicated house organs. Capable men can earn up to $500 or $1,000 monthly. Large sales to reputable firms. Big repeat commissions. Eastman Folks, South Bend, Ind.

LOCAL Representative wanted for large manufacturer, maker to wearer fine shirts, ties, hose, underwear below store prices. Sensational free offers bring easy orders. Big cash commissions. Free shirt, tie offer, cash bonuses. Outfit free. Write Dept. F 29, Albert, 860 Sixth Ave., New York.

SALESMEN Wanted to sell calendars and advertising specialties. Liberal commission. Side line or full time. Money making proposition. Standard Advertising Co., Fort Scott, Kansas.

MAKE $150.00 per week! New legal salesboard plan. No investment to anyone. Season starting. Act quick! A&J Novelty Co., 107 Washington, Arlington, Nebr.

NEW! No competition! Novelty shopping bag appeals to housewives. Instant seller. Big profits. Pocket sample. Virgin territory. Art Rug Co., 21 E. VanBuren, Chicago.

BIG Profit putting our genuine gold leaf sign letters on store windows. Spare time unnecessary. Samples. Consolidated, 69-V West VanBuren, Chicago.

I'VE fixed 5,000 men in good paying jobs, selling shirts, ties, hosiery, underwear, work shirts, suede shirts, etc. I'll give you a marvelous outfit free. Remarkable values get orders and repeats. Big cash commissions and bonuses. Write Dept. H2, Quaker, 1107 Broadway, New York.

SELL Nothing—$170 weekly. $500,000 punchboard firm announces new no investment plan. Season starting. K&S, 4326 Ravenswood, Chicago.

$60 WEEKLY Easy! Sell amazing value virgin wool 2 pants suits as low as $17.50. Also topcoats. $5 profit. Union tailored—guaranteed. Sample suit for producers. Outfit free. Williams Bros., 879 Broadway, Dept. W-22, New York.

BUSINESS Stationery. Largest line. Highest quality. Quickest delivery. Biggest commission. Bonuses. Free copyrighted outfit. Experience unnecessary. Outfit free. Williams, 2130 Gladys, Dept. 531, Chicago.

$15.00 DAILY Selling union label business stationery $2.75 per 1000; cards and blotter cards 1000 for $1.30. Free cut service. Big commission. Outfit free. National, 108-28 No. Jefferson, Chicago.

GOOD Paying job open as local representative, old successful manufacturer selling direct to wearer. Guaranteed work pants, breeches, coveralls, shopcoats. Largest line in field. Belt free with every 3. Big cash commissions. Sample free. Comfort-wear, Dept. P2, 489 Broome St., New York.

$136.00 COMMISSION From $6.95 sale! You can make 3 sales daily—full time—spare time. Big flat rate. Sales Stimulators, Dept. 1111, 4311 Ravenswood, Chicago.

SALESMEN—At last! New feature sells punchboards everywhere. Dealers wild with joy—prosperity back again. Profits enormous. Samples free. Puritan Co., 1407 Jackson Blvd., Chicago.

FOR Big income, sell garages, gas stations, machinists, R. R. men, amazing safety non-slip shoes. Exp. unnecessary. Sample free. Atlas Shoes, 75, Waltham, Mass.

SALESMEN—Dynamic trade stimulator, beautiful Stutz junior automobile, 6 feet long, free to merchants. $15 advance commission each sale. Drimuer, 927F Broadway, New York.

ARE You old at forty? See our advertisement on page 52 of this issue. The Electro-Thermal Company, 2150 Morris Ave., Steubenville, Ohio.

SELL The Wonder Blade Holder a good pocket knife, sells for 25c. 100% profit. Steel Specialties Mfg. Co., 2345 Nova Ave., Chicago.

GIVE Away ladies pure silk stockings or double compact—with wonderful sales of toiletries. 100% profit. Paris Laboratories, 3145 Locust, St. Louis, Mo.

SELL Necessity! Make $15.00 daily. Easy repeat business. Advance commission. Pure Silk Hosiery, 175 Fifth Ave., New York.

PREMIUM Salesmen—Brand new trade stimulator appeals instantly all lines retail business. Just what you need now. Big commissions. Well rated company. Outfit free. Salesmanager, 4th Floor, 308 North Michigan, Chicago.

SALESMEN—Four $13.00 sales to stores net you $48.00 daily. Sayers Systems, Est. 1895, 2801-123 Sheffield Avenue, Chicago, Illinois.

SALESMEN-DISTRIBUTORS: New auto tire patch; guaranteed 10,000 miles. Repairs blowouts permanently. Sells garages, gas stations, tire shops. Salesmen's profit 100% up to 300% to dealers. Easy seller. Exclusive territory. Economy Rubber, 608 Burkhardt, Dayton, Ohio.

FREE Booklet describes 67 plans for making $20-$100 weekly in home or office business of your own. Elite Co., 1-A Elizabeth St., New York.

MEN To sell batteries with complete line of supplies to garages. Lowest prices. Miekman Battery Co., St. Paul, Minn.

SALESMEN—Become independent. Own your business; experience unnecessary, selling our $10,000 accidental death; $50 accident; $25 sick weekly benefits—$10.00 yearly. Other amounts proportionate. Guaranteed steady income. Commissions $2,000 deposited insurance department. Universal Policy Dept. A, 716 Lefcourt Bldg., Newark, N. J.

WONDERFUL Opportunity. Twenty dollars per day can be earned. Experience unnecessary. Home protection at cost. Ages one to eighty. $250 to $1000 at death. Not insurance. You make $5 for each member secured. Childress, of Virginia, sent in $4 one day. National Aid Society, Myers Building, Springfield, Illinois.

PENNY Golfer, new fascinating coin-controlled game. Legal. Novelty Merchants everywhere busy. Splendid commission. Specialty Mfg., 617 Division, Chicago.

NEW Specialty—Sells every business and professional man. $2 to $5 sales daily pay $280 weekly. Foyer cleared $4920 in three months. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

HELP WANTED

A RICH Opportunity—Men-women! The offer of a lifetime! We put you in a business of your own, which is operated by anyone, anywhere, requiring an investment of less than two dollars. Our plan pays up to $50.00 weekly for cash profits in one day—with no selling, no ringing of doorbells! Grasp this home-opportunity to enjoy complete financial independence, be your own boss. Quick action necessary. Write or wire at once. Novelty Studios, Inc., 56 E. Randolph, Dept. 54, Chicago.

SPARE-TIME Workers, to clip advertisements from newspapers, write advertisers' names, mail us. Sample and details free. To eliminate merely curious people, 25 cents deposit requested. Returned with first pay or otherwise ordered. New York Service Company, Box 39-110, Station K, New York.

RELIABLE Man to look after my business in your locality. Unusual opportunity to make $15 a day. Write for full particulars. Albert Mills, 1565 Monmouth, Cincinnati, O.

CASH Paid for butterflies, Insects. See Sinclair Display Advertisement on page 10.

AMAZING New electric ironer presser good for $25 daily; puts razor edge in pants in 10 seconds, sells for $2.50; your commission $1.00. Sample $1.00. Mummy Mfg. Co., Dept. C 8B, 817 Main St., Cincinnati, Ohio.

AGENTS—Mosco corn and callous remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Mosco Company, 204 Searle Bldg., Rochester, N. Y.

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LEARN Bookkeeping and accounting at home. Income tax accounting a specialty. Address Prof. W. F. Grotts, Butler, Illinois.

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SOUND Motion picture engineers wanted. Learn to operate. Free practical training when course is completed. Easy terms. 50% of tuition available employed. 1918 North Rowan Ave., Dept. A, Los Angeles, Calif.

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WANTED, Men-Women, 18-50, qualify for steady Government Jobs. Salary range, $105-$250 month. No Government experience required. Paid vacations. Common education sufficient. Thousands appointed yearly. Write Ozment Institute, 101, St. Louis, Mo., immediately.

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NEW $4.75 Automatic Adding Machine. Fully guaranteed. Bassett, 1458-C, Hollywood Avenue, Chicago.

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250 LETTERHEADS, Envelopes, cards, statements, billheads, blotters, $1.00 each. Fine stock. Cane Cod Printers, Box 901, Hull Block, Mass.

MAKE Sales with facsimile typewritten copies, your letter; 100 for $1.00, samples. A-G Service, Fifteen Park Row, New York City.

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1,000 3-PLY Business cards or 3x5 plugers $1.35 postpaid. Fitch, 419 East 113th, Chicago.

200 SHEETS, $1.00, Envelopes, 94c. Applebaum-P. 1258 Brook, New York.

THREE-COLOR Business cards, $2.95 thousand. Crescent, 1715½ Wood, Dallas, Texas.

250 BOND Letterheads, envelopes, billheads, cards, $1.35 each. National Press, 196 Canfield Ave., Bridgeport, Conn.

1000 BUSINESS Cards $1.40. Bradshaw, 3214 Huron Street, Chicago, Ill.

5000 ATTRACTIVE Envelope folders, $11.50; envelope slips, $5.00; 629 circulars, $7.50. Samples. Goodprint, Harrisonburg, Va.

1000 BUSINESS Cards, card case, $1.50. Miller, Printer, Narberth, Pa.

QUALITY Printing for less—Letterheads $3.50, envelopes, business cards $2.65. 1922-depression pricelist. Pound samples dime. Large equipped plant. Webb-Print-Press, Gettysburg, Penna.

WE Print stationery, booklets, catalogs, circulars. Samples. Commercial Press, Batavia, Ohio.

LETTERHEADS, Envelopes, 500, $1.10; 1,000, $2.00; $5,000, $8.00, plus postage. Samples. Coyle & Kimballs, Newport, N. Y.

250 BOND Letterheads, envelopes, billheads, cards, $1.35 each. Economic Press, Leonia, N. J.

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GORDON Job press, paper cutter; good condition, cheap. Printcrafters, Indianapolis.

PRINT Your own circulars, envelopes, with home made press costing less than $1.00. Illustrated instructions 10c. Carl Edquist, Odessa, Minn.

BUILD An 8x10 printing press for $1.00. Complete instruction only 50 cents. K. Wise, 100 E. Broadway, Red Lion, Pa.

COMPLETE Printing outfits, presses, type, ink, paper, supplies. Write for free catalog. Kelsey Co., R-11, Meriden, Conn.

PRINTING Outfits—Presses, type supplies, type novelties. Send stamp for catalog. Model Press, York, Penna.

GUMMED LABELS

COLORED Stickers pay. Economical, too. Samples. Rex, 6618F Quimby, Cleveland, Ohio.

1,000 PRINTED; Name, business, address 50c. JBS Company, Box 93, Holyoke, Mass.

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STENCIL Duplicator—Anyone can make. Particulars free. Grinstead Laboratory, Edwardsville, Illinois.

"EXCELLOGRAPH" Rotary stencil duplicator $39.00. "Two-Faced" film duplicator $6.00. Booklet free. Pittsburgh Typewriter Supply. Dept. 601, Pittsburgh, Pa.

RUBBER STAMPS

NAME, Address, 2 lines 25c; 3 lines 35c. Stamp Works, Auburn, Me.

RUBBER Stamps: Name, 2 lines 25c, 3 lines 35c. Newman, 120 So. 15th, Lincoln, Nebr.

ELECTRIC CLOCKS

"SPLIT Second" electric clock movement, only $1.99. You get $5 to $10 for it—send dime for "Make Big Money Electrifying Clocks". Kunerth, Guttenberg, Iowa.

THE Newest development for the electrification of old clocks. Make real money every day. Absolutely no tools. Electrify as you solicit. Universal-Capitol Unit Co., 2134 Lombard Street, Philadelphia, Pa., Dept. S-1.

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WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 201 N. Hoyne Ave., Chicago.

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INVENTORS! Copyright a description or drawing of your invention or patented article in our magazine. This will help secure you direct evidence for priority patent claim. Promoters! Your advertisement will put you in direct touch with those whose money are seeking. Advance Publishing Company, 40 Lankershim Bldg., 3rd and Spring Sts., Los Angeles, Calif. Established 1911. Sample copy of magazine 10 cents.

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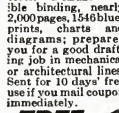
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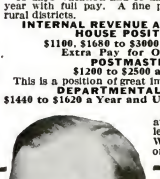
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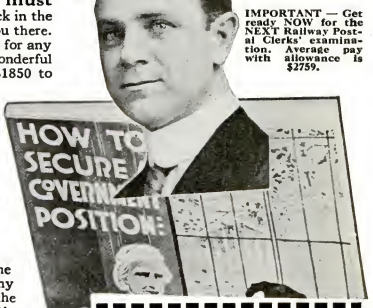
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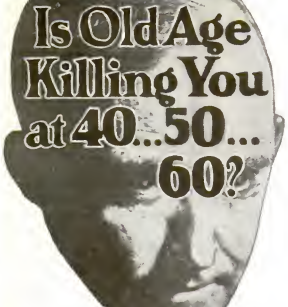
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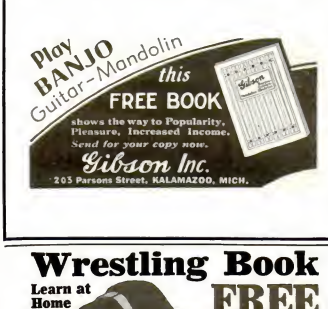
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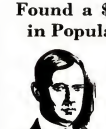
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SAMPLE LETTER

How Phillip Scott Found a $1200.00 Secret in Popular Mechanics



"Some time ago I saw an article in Popular Mechanics which illustrated and fully described some grotesque figures carved out of hardwood that would crack nuts and be useful as well as ornamental. This clever idea appealed to me at once as a real money-maker and as a friend of mine, Phillip Scott, was out of work, I showed it to him. He read the simple instructions for making these unique dolls and became enthusiastic at once. He got busy making them and has since made over $1200 in profits by selling them to folks for household use and for gift purposes. He gets lots of orders because he is the only one who makes these figures, and as a result today has money for things he could not otherwise afford. We're both grateful to Popular Mechanics for his sake." . . . (He then states his reasons for thinking this is a good money-making idea.)—R. R. Pierce, Bookkeeper, Peoria, Illinois.

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No doubt you have seen many ideas in Popular Mechanics which struck you as being real money-makers. If so, you can win a big cash prize now by simply writing a short letter of 500 words or less, telling about some idea that you have found in any issue of Popular Mechanics. This may be an idea that you have seen or used yourself or simply an idea that you consider good enough to be used by somebody else.

That's all you have to do to win the $1,000.00 first prize or one of the many other fine cash awards. What an easy way to win a nice bundle of cash to do with as you please! Remember, you have as good a chance to win as anybody. So follow the simple rules below and mail your letter before the contest ends.

Simple Rules

1. In 500 words or less, tell about some money-making idea that you have seen in any issue of Popular Mechanics which you have used to make money or which you feel could be used by someone else for profit, and give your reason.

2. Write on one side of the paper only, either typewriter, pen and ink, or pencil.

3. Literary style and grammar will not be considered. Selections will be based on ideas and the reasons for your choice.

4. Send in as many letters as you please. Replies must be postmarked not later than midnight, February 10, 1932.

5. Anyone can enter this contest except employees of Popular Mechanics Magazine or members of their families.

6. Five judges will decide the winners and their decisions will be considered final.

7. Your name, complete address and your occupation must be plainly given at the end of your letter.

8. All answers to this contest must be addressed to Editor, Contest Number One.

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Contest No 2 $2500.00

Popular Mechanics Offers $2500.00 For Practical Money-Making Ideas

(*Contest Ends February 10, 1932*)

THIS contest is entirely different and separate from Contest No. 1, which is described on the opposite page. Its purpose is to reward thinking folks who send in practical money-making ideas suitable for publication in Popular Mechanics Magazine. Fifty-five big cash prizes, totaling another $2,500.00, will be given away for the best letters—in addition to the fifty-five cash prizes offered in Contest No. 1.

Think of it! All you have to do to win a handsome cash prize in this unusual contest is to send in a short letter of 500 words or less presenting your money-making idea. It may be an idea that is already helping you or some friend of yours to make extra money. It could be something to do at home, such as canning fruits and preserves or renting rooms to tourists, or it might be something like killing animal pests for bounty.

No matter how small your idea seems to be to you, do not hesitate sending it in at once. It is the simple, practical suggestion that is likely to win the first prize of $1,000.00. You can enter one or both of these contests and send in as many letters as you wish. Literary style or grammar is not a factor. Awards will be based on the ideas and reasons submitted. So get busy at once and send in your letters. You may be $1,000.00 richer by next spring if you do!

Simple Rules

1. In a letter of 500 words or less, state briefly your money-making suggestion. Your idea may be something that you or someone you know is already making money with. Or it may merely be a plan that you believe anyone can use to advantage for profit in full time or spare time.

2. Write on one side of paper only.

3. Literary style and grammar not considered. Selections based only on merits of ideas and reasons submitted.

4. Send in as many letters as you wish. Replies must be postmarked not later than midnight, February 10, 1932.

5. You can enter either or both of these contests. (Anyone is eligible to compete except employees of Popular Mechanics or members of their families.)

6. Winners of prizes in Contest No. 1 are eligible for prizes in Contest No. 2 but no one can win more than one prize in each contest.

7. Five judges will decide the winners and their decisions will be considered final.

8. Your name, complete address and your occupation must be plainly given at the bottom of your letter.

9. Replies to this contest must be addressed to Editor, Contest Number Two.

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SAMPLE LETTER

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"Early this spring, I was laid off at the garage," writes Walter F. Kole. "Rather than sit around idle, I decided to fix up my back yard which I had never had time to give attention to. Soon I had a beautiful lawn and lovely flowers shooting up. One day while I was sprinkling my garden, my next door neighbor, an old widower who was in ill health, offered me $25 to fix up his garden and $5 a week to take care of it after that. You bet I grabbed his offer. That gave me the idea to go after other neighbors and friends who either didn't have the time or weren't physically able to do this work. My plan worked out so well that now I make as high as $45 a week and enjoy the work very much more than at the garage." (He then states his reason why he thinks this idea a good one for publication in a magazine like Popular Mechanics.) Walter F. Kole, Mechanic, Brooklyn, N. Y.

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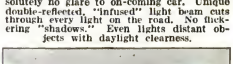
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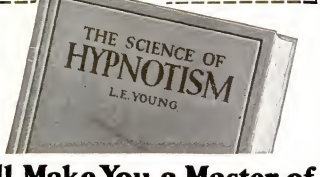
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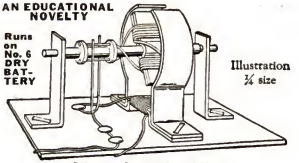


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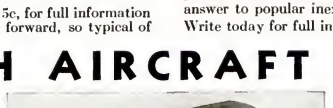
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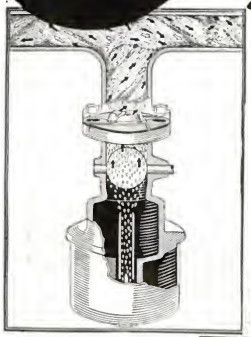
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Automobile owners who have been worrying about gasoline expense will be interested in an amazing test recently conducted by a Texas Motor Car Company. Twenty-three cars were entered in a mileage economy test, the winning car running 51 miles on a gallon of gas, the second car 49 miles on a gallon. When official test records were published it was found the two winning cars were both equipped with Whirlwind gas savers.

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The principle of the Whirlwind is to slightly compress the partly vaporized gasoline as it passes thru the raised venturi. Extra air enters from four air inlets at such a tangent as to piek up the unvaporized gasoline particles, whirling them into action.

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GUARANTEE

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Car owners all over the world are amazed at the results of their tests. "I have more speed, power, and increased mileage," writes Henry Bomberger. "Hills I used to take in second I now make in high." Anton Wetsch: "I wouldn't take the Whirlwind off my car for any money. I am certainly convinced." W. B. Fountain: "My mileage has increased greatly. My car has plenty of piek-up and starts like a whip."

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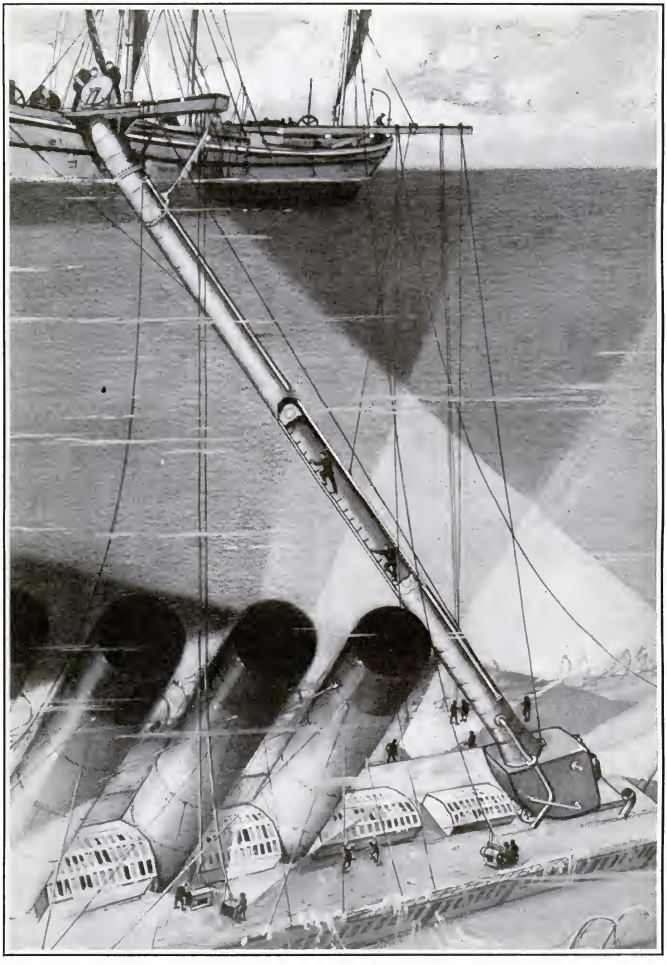
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Drawing Depicting How It Is Proposed to Recover the Treasure from the Wrecked "Lusitania" by Utilizing an Ocean "Stairway" Leading from Surface to Sea Floor

Popular Mechanics Magazine
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Vol. 57 FEBRUARY, 1932 No. 2

a2370

LUSITANIA TREASURE to be RAISED



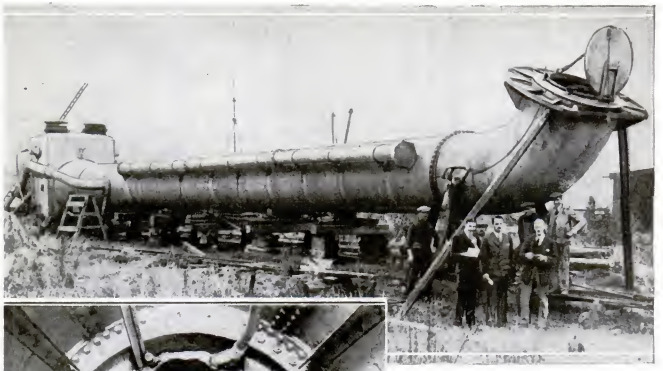
Above, Top of "Stairway" Leading Down into Atlantic; Below, Lowering Powerful Submarine Lights

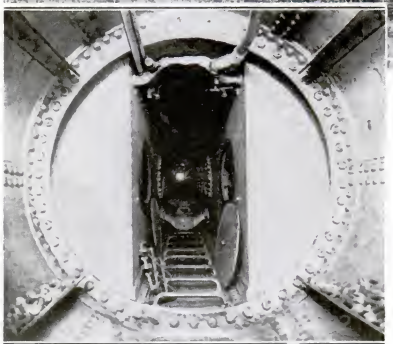
DOWN a steel-incased stairway inside a 200-foot tube, deep-sea divers expect to descend soon to the wreck of the historic "Lusitania," sunk in 240 feet of water eight miles off the Irish coast, in 1915, by a German submarine. From the end of this ocean stair, the divers propose to step onto the decks of the ill-fated liner and, with the aid of powerful submarine searchlights, will search every foot of the vessel, salvaging all articles of historic and intrinsic value, including the purser's safe and its contents.

The salvaging expedition is under the direction of Simon Lake, maker of submarines and inventor of the tube that is to be used, which was tested recently in the English channel. By employing this tube, Mr. Lake asserts the venture has been made as simple as "going down in an elevator" and less hazardous and difficult than other salvaging operations that have been carried out successfully.

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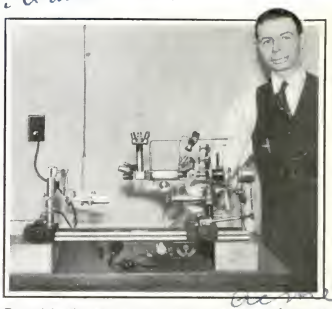
Two Views of Diving Tube Intended to Reach Sunken Vessel; Below, Electrical Camera to Be Used

launch will be used as bases of operations. The tube is five feet in diameter, but the observation room at its end, eight feet wide and twelve feet long, has a number of windows and will accommodate several persons at one time. This tube is to be placed on the upper deck of the "Lusitania," which, it has been found, is standing almost upright on the ocean floor, the tops of its stacks being only 175 feet beneath the surface.

Those entering the tube will walk down the stairs under normal atmospheric pressure until they enter the divers' operating chamber, outside of which will be various motor-operated winches and two doors providing exits for the divers. Before these doors can be opened, a pressure of air must be admitted into the chamber equal to the water pressure outside, about eighty-five pounds per square inch at that depth, and it is impossible to open the doors until pressure is equalized. The doors move downward, and no water can enter since the air flows outward from the compartment. With the aid of powerful searchlights, which likewise withstand a pressure of eighty-five pounds or more, the divers will explore

the vessel, spectators watching them from the observation room, as it is expected vision will be possible for from forty to sixty feet. One of the main advantages of the tube will be that divers can start to work fresh because, in deep-sea work, much of their time under water is spent in descending and ascending. As articles of historic or intrinsic value are uncovered, they will be raised by a derrick.

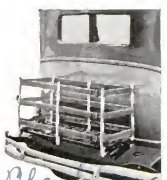
One of the first tasks, when the ship is reached, will be the taking of a complete photographic record of the wreck, from both the inside and outside of the vessel, employing the powerful lights to provide illumination. An electrical camera is to be used for this work, and if pictures are obtained, they will be the only ones ever taken at so great a depth under water.



Powerful Microscope Which Magnifies 5,000 Diameters and Brings Tiniest Bacteria to View

EXPANDING RACK FOR YOUR CAR FITS ON LUGGAGE CARRIER

Carrying facility for every size and kind of package or luggage is supplied the motorist who often wonders how he is to secure all his boxes and odd luggage to his auto, by a rack that fits any standard luggage carrier. The "form-a-rack," as the device is called, can be readily adjusted to any four-sided shape and is quickly and easily attached. Six individual standards clamp to the trunk rack and have five slots for three or more heavy web straps. When not in use, the rack may be rolled up and carried in the tool compartment.

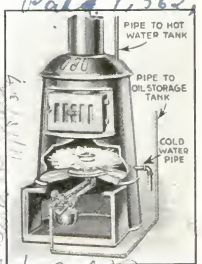


MOST POWERFUL LENS BARES NEW INVISIBLE WORLDS

Hitherto invisible bacteria have been brought to view by a recently invented microscope more than twice as powerful as any that have been used previously. New fields of scientific research, particularly in bacteriology, are opened by this instrument by which bacteria have been magnified 5,000 diameters in tests. Dr. Royal Raymond Rife, its inventor, believes he may be able to magnify objects to 17,000 times their natural diameter. Heretofore the greatest power obtained by glasses has been about 2,500. Six quartz lenses are used in the microscope, and another unusual feature is that the object viewed, instead of being seen in reverse focus as with present instruments, is observed in its true perspective. It is expected that the glass will enable scientists to study bacteria so tiny that they pass readily through a stone filter.

OIL BURNER TO FIT ANY HEATER HAS GRAVITY FEED

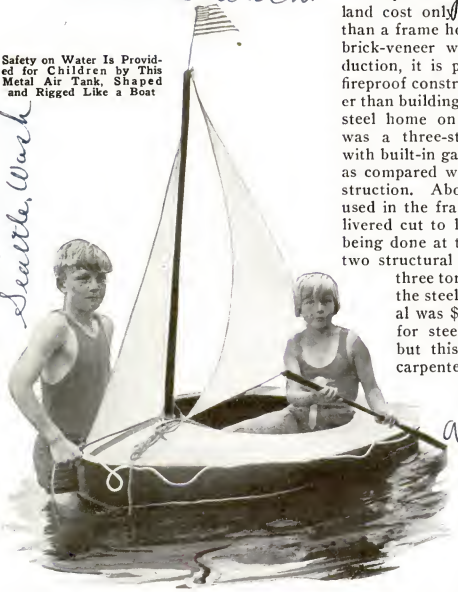
Economical operation of any furnace or heater is made possible by an oil burner which has a gravity feed, eliminating special machinery, gas, electrical or mechanical parts. This oil burner, now on the market, uses distillate, the cheapest of fuels, or furnace oil. Fed to the burner by gravity, the oil is mixed with air to produce a gas for the flame. Any overflow is prevented by means of a safety valve which operates automatically.



a 2209 Builder. O. T. Langsea 950 W 63rd St Seattle Wash.

 Chicago Ind 11/29/30

Safety on Water Is Provided for Children by This Metal Air Tank, Shaped and Rigged Like a Boat



Mech. Daily Show Rooms 6212-15th N.W. Seattle, Wash

SAFE PLAYBOAT FOR CHILDREN IS AIR TANK OF METAL

Shaped to boat design with a seat in the center for passengers, an air tank of metal has been fashioned into a safe playboat for children. The craft is equipped with a removable mast, sails, rudder, paddle and a life line. Adults may use the boat for planing behind a motor craft. Galvanized iron is used in its construction.

a 2407

COST OF WELDED-STEEL HOME ABOUT SAME AS WOOD

Figures showing the comparative cost of a home with a welded steel frame and one with a wood frame indicate that the steel house is now within reach of the pocketbook of the ordinary builder. The Iron League of Chicago recently compiled statistics to show that a brick-veneered welded-steel-frame house built in Cleveland cost only twenty-four dollars more than a frame house of the same type with brick-veneer walls. With quantity production, it is predicted that welded-steel fireproof construction will be much cheaper than building with wooden frames. The steel home on which figures were kept was a three-story, nine-room structure with built-in garage, the cost being $12,532 as compared with $12,508 for frame construction. About ten tons of steel were used in the frame, the material being delivered cut to length only, all fabrication being done at the site by one welder and two structural iron workers who put up three tons of steel the first day. For the steel home, the cost of the metal was $881 as compared with $180 for steel for the frame structure, but this was offset by savings in carpenter labor, rough lumber and masonry, cement and stone work.

228 N. La Salle Chicago

a 2304

LIQUID ADHESIVE FOR BANDAGE IS EASY TO APPLY

Bandages can be fastened quickly and securely with a liquid adhesive that dries instantly, and is as easily removed as applied. Instead of unrolling and cutting adhesive tape to the right size and shape, a little of the liquid is squeezed from a tube onto the bandage, the fastener being particularly convenient for flat areas where the bandage cannot be wound around the injured part. The adhesive resists oil, water or gasoline, but easily dissolves in chloroform or acetone.



Bandages Fastened with Liquid Adhesive Which Is Easy to Apply and Simple to Remove

Robert A. Bernhard 153 Anderson Ave Rochester, N.Y.

SUPER-SPEED TUBE FOR X-RAY PHOTOGRAPHS HIDDEN ILLS

X-ray pictures snapped in one-thousandth of a second by a new tube are expected to reveal in the human body the beginnings of disease hitherto blurred or hidden by motion. This development in X-ray tubes is based on the discovery of a method of damming up the electric current like water behind an obstruction, and then letting the dam burst, the electricity rushing into the tube and snapping the picture at high speed. Three electrodes are used instead of the usual two, so that two can be combined into a sort of dam, behind which the electric charge is built up. When the charge is released, one electrode is changed from negative to positive, releasing the current into the tube. It is the invention of two scientists of the Westinghouse Lamp company.

ICE SKATE THAT FITS ANY SHOE HAS TOE LACES AND STRAP

Equipped with toe laces and a heel strap, the latest ice skate will fit any shoe. The fastening arrangement is more secure than clamps, and as strong as the riveted-to-shoe skate. Ordinary shoes or oxfords may be worn. To put on the skate, the shoe is inserted so that the toe leathers can be laced tightly and tied. Then the heel strap is fastened with its tongueless buckle. There are no metal working parts to rust and no clamp keys to lose in connection with this form of attachment.



RUBBER FROG LURES FISH

Since frogs are a natural food for most game fish, bait resembling live frogs is now being offered. This lure is made of a composition of cork, rubber fabric and other materials. In size, shape, coloring and action the frogs are lifelike, and the white underside makes them tempting and effective lures for night fishing. They can be used without becoming entangled among weeds and are made in three sizes.



Steel Box behind Target Catches Bullets, Making Indoor Practice Safe

STEEL BACKSTOP FOR BULLETS AIDS INDOOR PRACTICE

Indoor practice with rifle or pistol is made safe by a steel backstop for bullets. The backstop has a curved back plate which deflects the bullet downward into the bullet box, while a projecting lip on the bottom plate prevents ricochet and back spatter. A bullet cannot return to the mouth of the target box, and wear on the deflecting plate is negligible, due to the curve construction.

RAZOR BLADES REMOVE SLEET FROM AUTO WINDSHIELD

Sleet and ice can be cleared from the windshield of the car by two safety-razor blades which fit in an attachment easily fastened to any windshield wiper. The blades are set at an angle so that the motion of the wiper causes them to cut away snow and sleet with each move across the glass.



A2423 Cont. Thos E. Stimson Jr
145 S Spring St
Los Angeles Calif

The BATTLE of the



Start of the 500-Mile Race at Indianapolis in 1931; Left, Louis Schneider, Winning Driver, and His Mechanic, Jigger Johnson



By THOMAS E. STIMSON, JR.

AFTER several years of retirement, the giants of the motor-car industry are preparing to fight it out again this year in the world's outdoor laboratory of automobile perfection—the Indianapolis speedway.

Early racing by the manufacturers did much to test materials and improve designs. But eventually the glamour of the track diminished and the factories became too busy to pay much attention to brute speed.

Now, however, keen competition in the industry and startling new design features, brought out in the last year or so, have resulted in the makers again turning their attention to racing, and several plants are constructing speed creations in secret for the 1932 grind.

"You are really driving a racing car yourself," explains Harry Miller, famous designer. "Today's automobiles are actually the racing cars of a few years ago, modified to suit your special needs. When you take the wheel of a new car, you are

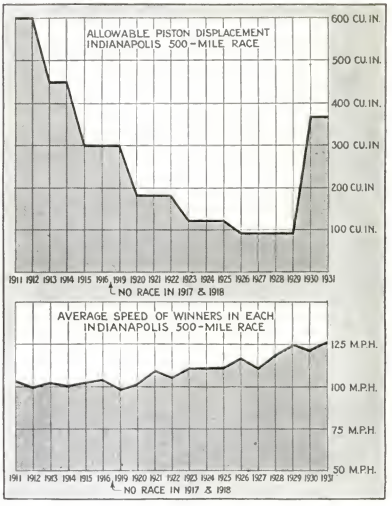
2652 Long Beach Ave.
Los Angeles. Calif.

a 2923

GIANTS Four-Wheel-Drive Racers on the Way



Above, Modern Racing Car with Modified Streamlining; Right, Charts Showing Piston Displacements for Indianapolis Races and Average Speeds of the Winners



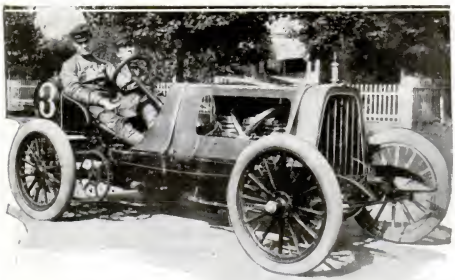
driving the same sort of machine that was raced by Tommy Milton, Peter de Paolo, Billy Arnold, and other well-known drivers."

From three to six years usually elapse before an improvement in racing design is adapted to pleasure cars. The new developments must first prove their worth by helping win races. Then they must receive other thorough tests and perhaps be redesigned to allow volume production.

"Practically every feature of your car was first developed for the racing cars," says Mr. Miller. "For instance, your tires are racing tires. A few years ago, the tire factories had to build special racing brands for the track because the treads would fly off the regular type at high speed. Since then, nearly all tires have been improved up to racing requirements and only one factory is now making a special racing tread.

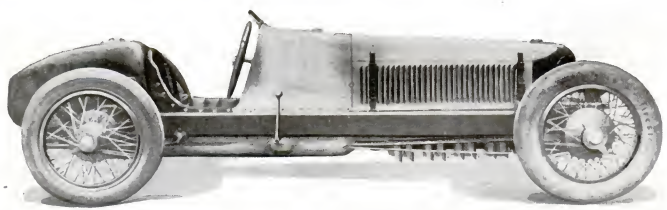
"Back in 1914 we had the Santa Monica road races. The course was over city streets and had several right-angle turns. So we built a car with four-wheel hydraulic brakes to allow the driver to make speed right up to the corners. The automobile industry made the brakes prac-

42423



was too high. By developing a better design and using a water pump, we were able to reduce radiators to a fraction of their former area. Water pumps then began to appear on the stock cars.

"Modern steering came in the same way. Racing drivers found it difficult to make their turns accurately at high speed. The present types were finally developed for them, and now steering





Top, Chain-Drive Racer of 1907; Center, Front-Wheel Drive of 1924-25; Below, Types of Pistons

tical from a production standpoint about the year 1924.

"Another instance is the front-wheel drive. The first efficient car of this type raced at Indianapolis in 1925. Four years later, front-wheel-drive cars were on the market. Again, multiple carburetors were developed for racing cars in 1916. They were adapted for pleasure cars around 1925.

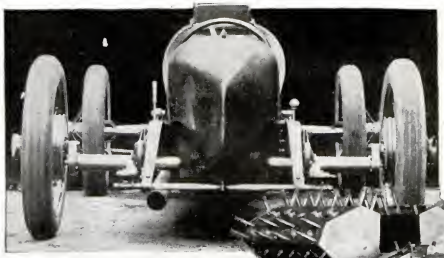
"Before the war, racing cars had huge radiators which proved very inefficient. Streamlining was impossible with them, and the center of gravity for the whole car is almost effortless. The small wheel sizes that are used today on every car were adopted first by racers, because they made steering easier. Present racing cars have even smaller wheels.

"Take the different metals that are used for a car. The early bronze bearings were good enough for pleasure cars, but they 'froze' up at high speed. So we turned to babbitt. Suspension springs formerly were made of soft steel, but so many breakages occurred that we tried the alloys. The same with valve springs.

"Crankshafts used to snap on the track, so European steel was imported. These steels were so much better that the entire industry demanded them, with the result that the best steels are now made in this country. Before the war, I wanted to try the effect of light-weight pistons in a racing engine, and obtained the aluminum in Germany. Aluminum pistons were so much better for racing that they are in general use today."

At his shop in Los Angeles, Mr. Miller has designed and built nearly 100 racing

a2423



Above, Single-Seat Racer; Right, Sixteen-Cylinder Racing Engine; Center, Piston Used in Racer; Bottom, Harry Miller Planning Racing Car



cars. Seven of the last ten winners at the annual Indianapolis classic were built by him.

Speed is not a matter of horsepower alone, Mr. Miller explained. The secret of speed is to develop power from as little weight as possible. Science has enabled the designers to build lighter, smaller engines every year, which produce as much power as, or more than, their predecessors. Racing designers turn the additional power into speed alone, but pleasure-car designers must break the power down into economy and faster pickup as well as speed. Small light engines, mounted in a racing chassis, require less power to



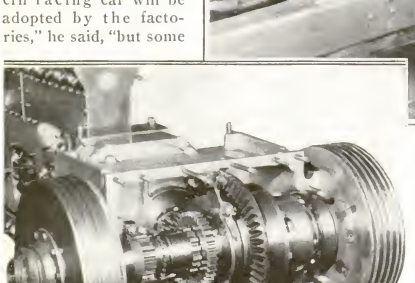
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be moved and can be streamlined more effectively.

What about the cars that we will be driving a few years from now? This question was put to Mr. Miller. For the answer, he referred to the racing cars of today.

"I don't mean that every feature of a modern racing car will be adopted by the factories," he said, "but some of the latest developments will be found practical for pleasure cars. For instance, many of the fast cars at Indianapolis have individually sprung wheels. This means that, when a wheel hits an obstacle or a hole, the jar is absorbed by the wheel and its special spring, and the car does not tilt. Undoubtedly this refinement will soon be found on some stock cars.





Top, Assembling Chassis of Racer with Individually Sprung Wheels; Below, Front-Wheel Drive Mechanism of Racer

"The chief difference between today's racing cars and today's pleasure cars is the difference in compression. Racing engines use compression ratios as high as twelve to one. That is, the combustion chambers are so small that the fuel charge is compressed to one-twelfth of its original volume before it is ignited. Such engines get much more power from the same amount of fuel than do pleasure-car engines that use six-to-one ratios. But the compression of pleasure-car engines is being increased every year. The high-compression racing engines require specially treated fuels that are not yet available in such concentrated mixtures to pleasure-car drivers."

At least one of the Miller specials at the 1932 Indianapolis race will be a four-wheel-drive car, a combination front and rear-wheel drive with a hydraulic clutch. This is the very latest development in racing design, and if it proves to be more efficient than the present drives, it may be incorporated in stock automobiles within a few years.

a2448

JOINTLESS HOMES TO BE BUILT BY GERMAN ARCHITECTS

Jointless houses are planned by German architects who have called on chemists to produce a plastic wall putty. Every joint in the floor is an accumulator of dirt. Every joint in a wall, wallboard or wainscoting is a danger point for the strength and durability of the construction. So future buildings must be jointless, say the architects. On the other hand, as joints are safety valves for stresses of expansion and contraction due to changing temperatures, materials and putty must be elastic.

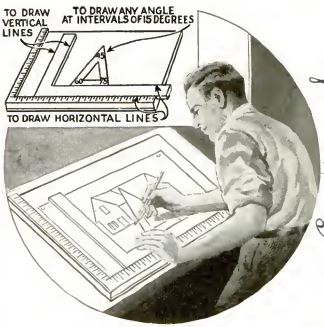
Statement from Dept of Commerce. U S Daily 12/3/31

Cleveland Plain Dealer 11/30/31 a2381 $7.50 & $10.00

a2435

RADIO FADING MAY BE STOPPED BY CHARTING EARTH'S AIR

Radio fading may be prevented by adjusting signals to correspond with the varying heights of the Kennelly-Heaviside layer of air which hangs over the earth like a blanket. A device for measuring the height of this layer from the earth has been developed by the United States bureau of standards, and an experimental chart or map is being prepared. It has been found that the air blanket, which lies about 100 miles above the earth, billows up and down like a circus tent in a gale. Radio waves strike this blanket and "bounce" back to the earth at varying angles, depending on the height of the layer, and, as a result, the waves are not always correctly synchronized with other waves which travel along the ground, and fading occurs. Constant operation of the measuring device will show how the Heaviside layer is shifting upward or downward, thus enabling broadcast stations to regulate their transmitters accordingly in order to provide better reception. Television is expected to benefit especially.



Drafting Equipment Requiring No T-Square or Tacks and Has Scale Built In

Draftsman's Co. 1603 S. Michigan Ave Chicago

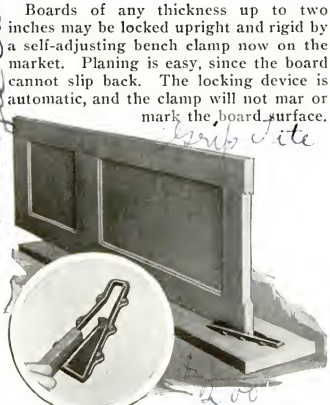
BOARD WITHOUT A T-SQUARE MAKES DRAFTING EASIER

Simplicity is the feature of a new drafting board that requires no T-square or thumbtacks. For the drafting room, the instrument is provided in the form of a board with an adjustable straightedge to hold one or more sheets of paper. For rapid sketching, a "block" can be purchased which will hold a renewable block of paper. Instead of a T-square and the usual series of triangles, all that is necessary to draw all vertical and horizontal lines is the square provided with the outfit and a specially designed forty-five-sixty-seventy-five-degree triangle for all angles at intervals of fifteen degrees. The paper clamps in the apparatus.

a2223

SELF-ADJUSTING BENCH CLAMP LOCKS BOARDS UPRIGHT

Boards of any thickness up to two inches may be locked upright and rigid by a self-adjusting bench clamp now on the market. Planing is easy, since the board cannot slip back. The locking device is automatic, and the clamp will not mar or mark the board surface.



Boards Are Locked Upright with a Clamp That Fastens on the Workbench

Chicago Drawing & Blue Print Co. 413 S. Wells St. Chicago

a2445

SAW HARDER THAN SAPPHIRES CUTS TREATED WOODS

Saws with hard alloy teeth are necessary for cutting woods treated with fire-resisting or preserving chemicals. Such a saw is now on the market, which has a cutting edge composed of tungsten, carbon and cobalt, an alloy which is hard enough to scratch sapphire. The hottest flame known, that of hydrogen, is necessary in manufacturing this cutting edge, which retains its sharpness at bright red heat, since it has no temper to be drawn. The abrasive properties of treated woods do not dull these teeth.

Averill & Sherry 546 Jackson Waukegan, Ill.

Henry Disston & Sons Inc. Tacony Philadelphia Pa

a2205 Showcard machine
11 92 Merchandise Mart
Chicago



Press for Printing Showcards by Hand in Operation; Note the Sample Cards Which Business Houses Are Finding Economical

SHOWCARDS PRINTED BY HAND ON FAST, SIMPLE PRESS

Showcard printing by hand can be done speedily and economically by a press now on the market. The equipment, which has been adopted by many business houses, can be operated by a person without previous knowledge of printing. Several fonts of showcard type come with the press.

CONTINENTS SHIFT IN LATITUDE WITH COOLING OF EARTH

a2429 Indian

Continents of this world, over a period of millions of years, probably slid up and down the scale of latitude in a continual shift of positions. This is the belief of two scientists of the Royal Geographical society of Great Britain who have evolved mathematical and geological formulæ as a basis for the theory. In simple tests, the scientists conceive that in a cooling world in which land masses first began to appear, the shrinking of the thin skin above the internal fires causes the newly formed and still semifluid land areas to move from the equator north and south according to the laws of centrifugal force. Evidence has been found that India once lay far south of its present location, for there are signs that its southern part once was covered with a heavy shroud of ice. The coal fields found in the northern hemisphere today may represent relics of a flourishing equatorial vegetation dating from the time when these continents lay in the region of the equator. The scientists believe the north pole must have been somewhere in the region of the Pacific ocean with the British isles near the equator. There is also evidence that the continents once were all joined but split up and slid relatively to one another and to the poles.

San Diego Union 4/12/31

Prof. A. L. Hinks and Prof. Arthur Holmes.

PEEPSHOW MOVIE TURNED BY HAND CRANK

a2352

Moving pictures for the individual are provided by a modern combination of the stereoscope and peepshow. After the film is inserted into a guide by means of pressure on a plate below the eyepiece, the rubber cup of the latter is placed to either eye, the hand crank turned and the show is on. The speed of the picture is controlled by the crank. Special film is produced for the machine.



One-Man Movies Are Possible with This Peepshow Machine Operated by Hand Crank

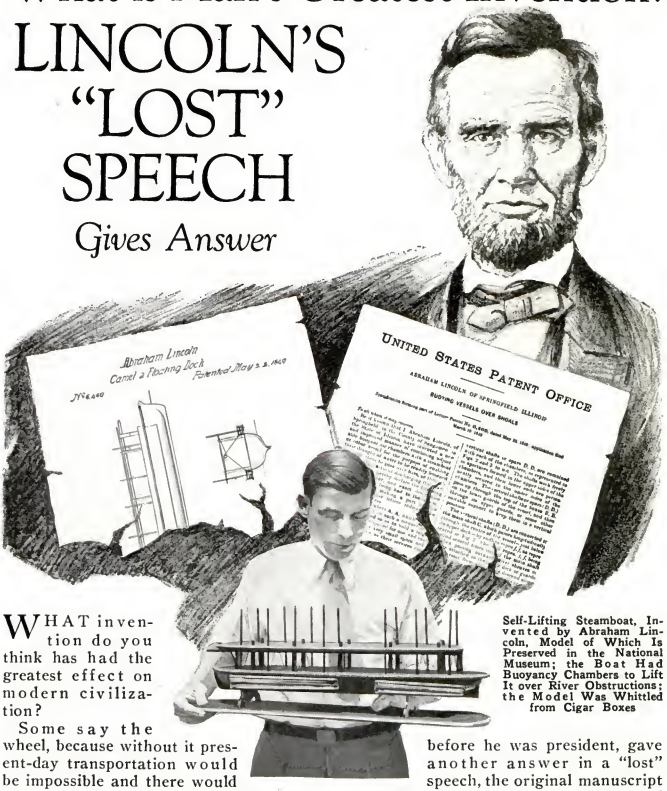
Movie Scope. Inc. Milwaukee Wis

a870 Capt. R. S. Thackwell, The Riviera, 4649 Beverly Blvd Los Angeles. Calif

What is Man's Greatest Invention?

LINCOLN'S "LOST" SPEECH

Gives Answer



Self-Lifting Steamboat, Invented by Abraham Lincoln, Model of Which Is Preserved in the National Museum; the Boat Had Buoyancy Chambers to Lift It over River Obstructions; the Model Was Whittled from Cigar Boxes

WHAT invention do you think has had the greatest effect on modern civilization?

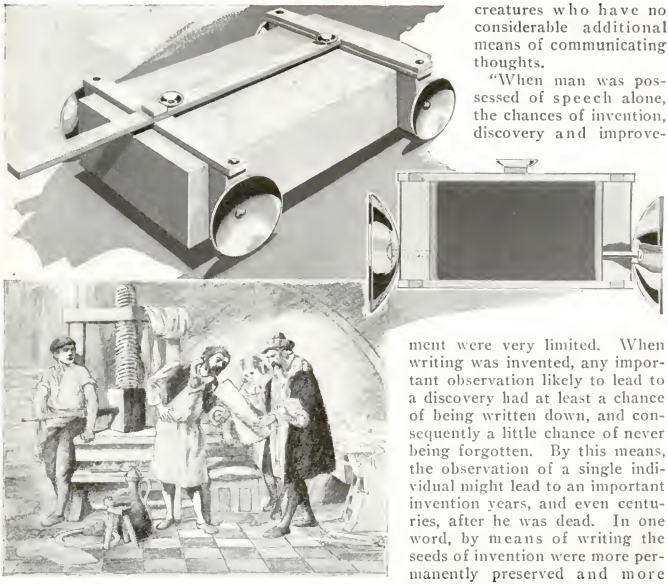
Some say the wheel, because without it present-day transportation would be impossible and there would be no lathes, dynamos or engines. But the Mayas developed a high degree of civilization without it.

H. G. Wells says it was the "taboo," or the social customs and restraints which mark the difference between civilization and a dog kennel and without which it would be impossible for people to live together in peace and harmony.

Abraham Lincoln, who was an inventor before he was president, gave another answer in a "lost" speech, the original manuscript of which is now in the possession of Oliver R. Barrett, of Chicago.

The great invention of the world is writing, the art of communicating thoughts to the mind through the eye, Mr. Lincoln declared in this lecture on "Inventions and Discoveries." "When we remember that words are merely sounds, we shall conclude that the idea of representing these sounds by marks, so that whoever

a.876



Top, Lincoln Wagon, and, Right, Diagrammatic View Showing Wheel Action, Much the Same Principle as the Steering Knuckle on Modern Auto; Ancient Printing Press, Below

should at any time after see the marks would understand what sounds they meant, was a bold and ingenious conception.

"The thought of dividing sounds into parts, and making a mark, not to represent a whole sound, but only a part of one, and then combining those marks so as to represent thousands of words, was somehow conceived and pushed into practice. This was the invention of phonetic writing, as distinguished from clumsy picture writing. Take this invention from us, and the Bible, all history, all science, all government, all commerce, and nearly all social intercourse go with it.

"Speech alone, valuable as it ever has been and is, has not advanced the condition of the world much. This is abundantly evident when we look at the degraded condition of all those tribes of human creatures who have no considerable additional means of communicating thoughts.

"When man was possessed of speech alone, the chances of invention, discovery and improvement were very limited. When writing was invented, any important observation likely to lead to a discovery had at least a chance of being written down, and consequently a little chance of never being forgotten. By this means, the observation of a single individual might lead to an important invention years, and even centuries, after he was dead. In one word, by means of writing the seeds of invention were more permanently preserved and more widely sown. And yet for three thousand years, during which printing remained undiscovered after writing was in use, it was only a small portion of the people who could write, or read writing; and consequently the field of invention, though much extended, still continued very limited. At length printing came, and consequently thousands of minds were brought into the field where there was but one before. Discoveries, inventions and improvements followed rapidly, and have been increasing their rapidity ever since."

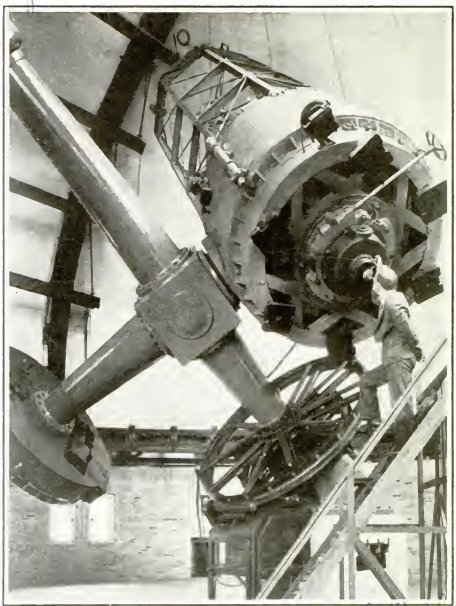
Declaring that Young America's horror is directed, in the main, against anything that is old, particularly "Old Fogy," Mr. Lincoln said that "the great difference between Young America and Old Fogy is the result of discoveries, inventions, and improvements. These, in turn, are the result of observation, reflection, and experiment."

Wayne L. Atwell a 2319
a 2428
prof. of anatomy

'SYNTHETIC' FROGS AID SCIENCE IN GLAND STUDY

Frogs which are slightly synthetic are being grown at the University of Buffalo where they are being used in studying the functions of the ductless glands. These frogs are altered in the tadpole stage when their pituitary glands are transplanted from the normal location at the base of the brain to other positions. Changes result, some of which are striking and visible, while others are internal, but all are scientifically important and of potential value to man. The pituitary heads the series of ductless glands which are intimately associated with growth, personal appearance, disease, insanity and, indirectly, probably with the emotions. The pituitary is difficult to study, however, for its system of control is complex, but transplanting cuts off some of its functions so that those remaining stand out more clearly. The gland that is transplanted is about the size of a pinhead. When grafted into the tadpole's tail it cannot change into a frog, but if moved to a position near the inner ear, the wiggler becomes a frog although the frog turns a silvery color instead of green, due probably to atrophy of one of the sections of the pituitary. If the frog is given extracts of a part of the gland taken from other frogs, it then turns green, but when the extract is discontinued, it reverts to silver.

Dan'l Greenberg 1.12731



Reflecting Telescope at Ohio Wesleyan, Showing the Welded Steel Tube; Its Mirror Is Sixty-Nine Inches in Diameter

Wide World

TELESCOPE HAS GIANT MIRROR TO REFLECT THE HEAVENS

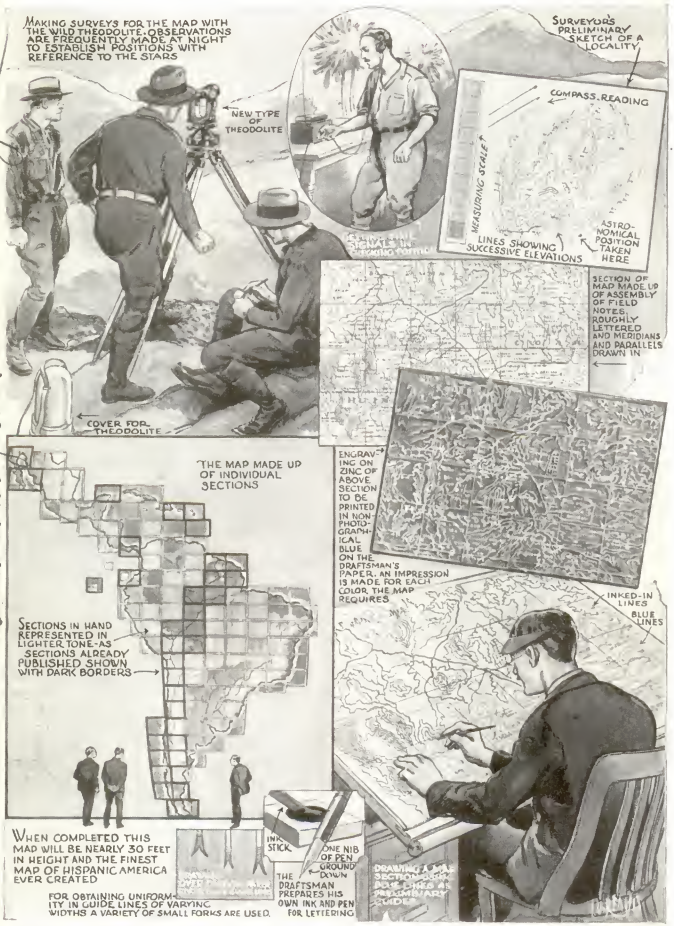
While it is not the largest, the recently completed reflecting telescope housed in Perkins observatory at Ohio Wesleyan University possesses many unusual features, including the first tube to be made of electrically welded structural steel. Its mirror is sixty-nine inches in diameter and was made from the largest piece of optical glass ever manufactured in this country. The mirror weighs 3,790 pounds and the tube 17,000 pounds. The telescope also contains an electric clock which keeps the instrument steadily focused on that part of the sky which is under observation. Through it astronomers are able to view stars 120,000 times fainter than the faintest ones visible to the naked eye.

Delaware, Ohio

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U2372 L.U.-Reavis, 55 W, 42 no 6
newark

Fourteen Years Needed to Finish Giant Map



Some of the Operations in Preparing a Sectional Map of Latin America, Which Will Be Thirty Feet High, and Laid Out on a Scale of About One Inch to Sixteen Miles

American Geographical Society
Broadway and 156th St. New York

U. S. SURVEY OF GRASSHOPPERS TO AID FIGHT IN SUMMER

First steps to avoid another outbreak of grasshoppers in the west and northwest next summer have been taken by the U. S. bureau of entomology. A survey, completed in December, was made to estimate the size of the 1932 grasshopper crop so that authorities and individuals could lay in supplies for the chemical warfare against the pests. Ordinarily, baits of arsenic-poisoned bran are distributed where the insects crawl the thickest, before they get their wings. The mild winter of 1930-31 caused a great abundance of hoppers, and local authorities neglected to take adequate steps to stop them, so that crops in many states were ruined.

ELECTRIC ALARM REMINDS YOU TO KEEP APPOINTMENTS

An electric alarm clock now being offered not only gets the family up on time in the morning, but regulates household tasks and appointments throughout the day. This time clock is set to alarm at the usual rising hour, then needs neither rewinding nor resetting, for it is simply shut off each morning and rings again at the same time the succeeding morning. By an adjustable dial at the base, it can be regulated to ring at the expiration of any period of time from one minute to three hours. In this capacity, it reminds the owner of appointments, and also tells when eggs are boiled, or baby's feeding time arrives, or when a favorite radio program is due.



OARLESS ROWBOAT OPERATED WITH PADDLE AND CRANK

Oars for propelling one type of rowboat are displaced by a paddle at the stern which is operated by a handle. Turning the crank causes the paddle to turn in a continuous figure-eight movement, and by stopping the handle in any position and swinging it in the opposite direction the boat is backed. Steering is accomplished by a quick stroke on the handle with a slow return on either side as desired. The oarless boat not only liberates one hand of the operator entirely, but enables him to propel the craft with much less effort than by the usual rowing method.



Oarless Rowboat with Propeller in Form of a Paddle Turned with a Crank

SADDLES FOR WINDOW CORDS REDUCE WEAR AND NOISE

Saddles of kiln-dried and oil-treated wood are being advocated by many builders and architects in the place of pulleys for window-sash cords. There are no flanges to cut or bind the cord. The saddles are noiseless, having no metal parts to squeak or rust, require no servicing, are said to be easier to weather-strip, and installation is simple. All that is necessary is to bore a hole the size of the saddle, insert it and secure it with a nail.



a 2196
Capt Andrew R. Boone
613 Spreckel Theatre Bldg
San Diego, Calif.

The TRUTH





Top, a Lion That Took a Fancy to a Photographer; Below, Slicking Up a Tiger for the Movies

A COMMAND barks out as a whiplash darts between iron bars on the hind quarters of an African lion. Through the open door and down a long chute, the lion dashes out into a clearing in the jungle. Two lines of men, armed with whips and sticks, shout orders as the animal runs quickly across and enters a second chute, to disappear in the heavy growth of shrubs and trees.

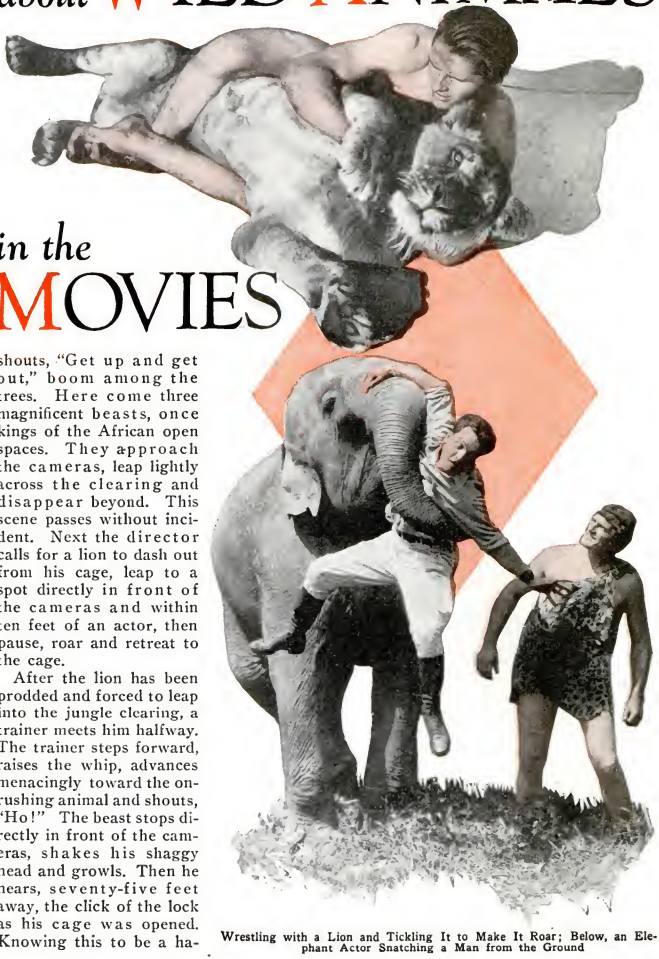
In rehearsal, the problem is simple. Actors remain safely outside the 200-foot jungle protected by thirty-foot wood and metal walls, while a half-dozen trainers, with quick words and stinging whips, direct lions, leopards and tigers—some of them jungle-born animals not long accustomed to the commands of man—in their bits of action preparatory to shooting jungle scenes in the heart of Los Angeles.

Singly, then in pairs and threes, the lions are prodded from their cages. They dash down between the lines of trainers to open gates ahead. After three or four rehearsals, camera crews enter the steel camera cages, actors return through the large swinging gates at the end, and the business of filming wild animals commences.

A director calls for action to start. Eleven cameras are trained on the clearing. The director raises his hand, lowers it. The gates click open and again the

a2196

about WILD ANIMALS *in the* MOVIES



shouts, "Get up and get out," boom among the trees. Here come three magnificent beasts, once kings of the African open spaces. They approach the cameras, leap lightly across the clearing and disappear beyond. This scene passes without incident. Next the director calls for a lion to dash out from his cage, leap to a spot directly in front of the cameras and within ten feet of an actor, then pause, roar and retreat to the cage.

After the lion has been prodded and forced to leap into the jungle clearing, a trainer meets him halfway. The trainer steps forward, raises the whip, advances menacingly toward the onrushing animal and shouts, "Ho!" The beast stops directly in front of the cameras, shakes his shaggy head and growls. Then he hears, seventy-five feet away, the click of the lock as his cage was opened. Knowing this to be a ha-

Wrestling with a Lion and Tickling It to Make It Roar; Below, an Elephant Actor Snatching a Man from the Ground

a2196

ven of safety, the lion turns suddenly and retraces his steps, thus developing an apparent attack and retreat which the director sought.

The fear that these beasts may turn suddenly on some actor never leaves the trainers. In every close-up, a trainer stands almost within arm's reach of the actor, with a safety cage, into which the actor can jump, immediately at hand. And when a leopard poises on the shoulders of some actor, the trainer stands just outside camera range, "cuing" it either by voice or by shaking and pointing a whip. Some animal pictures are filmed in sound, others with silent cameras. In the latter case, the growls and snarls are "dubbed" in later by a sound expert at the studio.

"Some animals," the trainer explained, "will act for the camera, others hate every lens they see. 'Jackie,' a lion; 'Gertie,' a jaguar; and 'Nissa' and 'Eckie,' leopards, work nicely for close-ups. These are filmed in sound, for they react quickly to silent cues. When training 'Nissa,' I induced her to snarl by grabbing the loose skin of her neck with my hand and growling at her. Soon she became accustomed to the part, associating a tug at her neck with snarling. An actor in apparent combat with the leopard, need only grab her neck, and she emits as savage a snarl as one would hear in any jungle.

"'Colonel' and 'Lady,' both tigers, work easily for close-ups, but not for sound. With them it is necessary to speak as well as shake a piece of cloth or a whip to guide them through a scene, and the difficulties of cutting out intermittent shouts from a trainer are too great to make this method worth while. The snarling, growling close-up is one of the most valuable scenes. Usually two



Baby Leopard Destined to Become a Movie Actor Being X-Rayed to Determine Seriousness of a Back Injury; Insert Shows a Leopard Rehearsing an Attack with a Trainer

Q 2196



Left, an Actor Fighting with a Leopard on the Wing of an Airplane, and "Cuing" the Animal to Snarl at Him by Tickling It under the Chin

Here Is a Leopard Taking Part in a Domestic Meal before the Camera; a Trainer, Out of Sight, Is Holding the Animal Firmly by a Chain, However

Animals Intended for Movie Careers Begin Their Training Early: Here Two Baby Lions Are Being Taught to Become Familiar with Themselves by Looking in a Mirror, a Task That They Appear to Enjoy

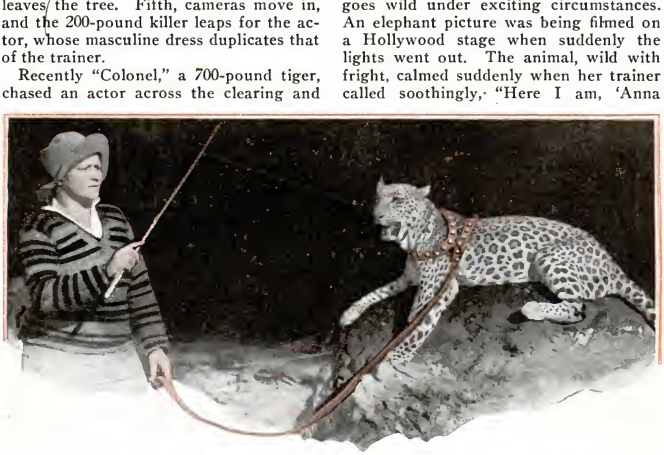
people appear in such a scene, one an actor and the other the trainer. While the savage beast may roar as though it wanted to tear the actor's heart out, it focuses attention on the trainer who by motion or words induces these ear-splitting noises."

Actors who enter the arena for close-up work with jaguars and leopards must be experienced. Fear registers on the animals as though it had been manifested by shouting. Any of these beasts might tear a trembling actor, unaccustomed to them, to pieces without warning. Rushes through the jungle and clearing offer fewer difficulties to directors than intimate scenes. Sometimes a whole day is consumed in rehearsing and filming a leopard, leaping snarling from a tree onto the back of an actor, and in working up the actor's nerve. First, the trainer pulls the animal down on his shoulders with a long leash fastened to the animal's body harness. Next, a verbal command, "Jump, Nissa!" and a tap on the animal's hind quarters with a whip, send her hurtling to the ground. Third, the same method induces her to leap on her trainer's back. Fourth, an off-stage human snarl or hiss causes the animal to snarl just as she leaves the tree. Fifth, cameras move in, and the 200-pound killer leaps for the actor, whose masculine dress duplicates that of the trainer.

Recently "Colonel," a 700-pound tiger, chased an actor across the clearing and up a tree. Probably he never saw the individual, because twice earlier that morning he had been run through the same routine to find pieces of meat hung high in the tree. He growled almost in the camera's face as he reared up, striving vainly to reach the bait, hung by a rope from the end of a stick held by the trainer, high in the branches.

Usually when the script calls for a scene that bids fair to be particularly dangerous, the trainer doubles for the actor. Such an arrangement was made when one actor declined to wrestle with "Olga," a leopard, on the wing of an airplane suspended thirty feet above the ground. Mme. Celeste, the trainer, climbed out on the wing, leading the leopard behind her. She stretched out on her back with the animal on top. She took the leopard by the neck with one hand, fending off the forepaws and mouth with the other. As the animal snarled, cameras cranked. A leather belt wrapped around a strut kept them from being dashed to possible disaster.

Elephants respond quickly to the human element. The problem often is not to make an animal wilder for a given scene, but to tame a beast that suddenly goes wild under exciting circumstances. An elephant picture was being filmed on a Hollywood stage when suddenly the lights went out. The animal, wild with fright, calmed suddenly when her trainer called soothingly, "Here I am, 'Anna



Trainer Teaching a Young Leopard to Lie Still and Snarl as a Preliminary to a Movie Scene; the Leather Harness Holds the Animal on the Rock if He Tries to Jump

a2196 a2118

May'." One director called for an elephant to stampede through the jungle and pull a man down from a tree. The trainer led "Anna May" through the scene three times, trotting alongside the lumbering animal. As they approached the tree, one limb of which overhung the jungle "trail," the trainer shouted, "Trumpet, 'Anna May'! Get him!" The beast emitted its jungle trumpeting sound, reached up with its trunk and pulled down the actor's double and carried him away. When ready to film the scene, the trainer stood outside camera range and at the proper time shouted the instructions. While the animal did not understand all the words, she knew it to be her cue and she halted momentarily in her wild charge, lifted the actor off the limb and carried him on down the trail.

Oddly, while lions roar and tigers snarl in thrilling, ear-splitting close-ups, it is not always the animal actor's voice you hear. The roar of some lions produces vibrations of such low frequency that they do not sound vicious after entering the sound apparatus. In one picture, a police dog's growls were substituted.

The usual method of training wild animals, whether for circus or talkies, consists in a trainer entering an iron-barred cage with a four-legged kitchen chair. The trainer holds the chair before him. The four points are impassable. Here the lion gets his first lesson in acting: He sits back and snarls and roars at this object of hatred.

From that point, the lion soon finds himself classified in one of several classes: He becomes a leaper, a bouncer, a growler, a wrestler or a runner, for these wild animals develop specialties. Sometimes five lions will double for the principal animal actor in a picture. The close-up will show a fine-appearing animal growling, while the shots of others leaping from trees or buildings down on the shoulders of actors, dashing through the jungle underbrush, or bouncing and snarling, will reveal substitutes or doubles.



Fashioning This Globe into a Prison for the Kittens, a Glass Blower Demonstrated His Ability without Harming the Feline Babies

KITTENS ARE SEALED IN GLOBE MADE BY GLASS BLOWER

Placed in a large glass tube, four kittens were imprisoned three minutes later in a twenty-six inch globe fashioned by an expert glass blower. A tiny air hole was left in the globe, and the kittens were unharmed while the globe was blown.

TELESCOPING BLADE FOR KNIFE CAN BE REPLACED a2226

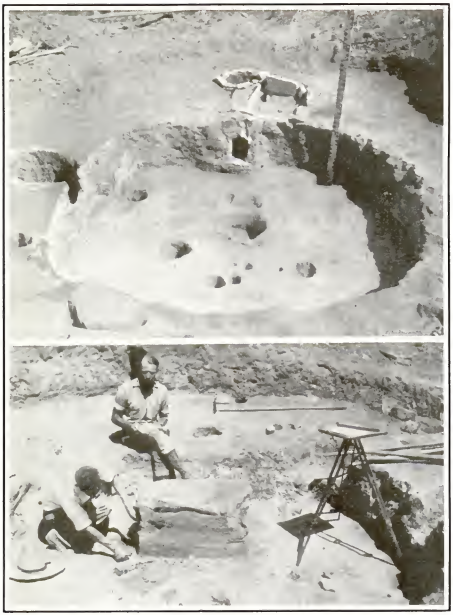
Adjusting the blade of a knife to the type of work to be done is a simple matter with a form of pocketknife containing an extension blade that slips in and out of the handle. The handle is slotted down the center and the blade is extended by pressing down and pushing forward a button for this purpose. The blade is adjustable to four positions, locking securely in each. It is easily replaced if broken.



Pocketknife with an Extension Blade That Slides Out of Handle; the Blade Is Replaceable

Lark Manley, Venice Calif.
Case Bros. Mfg. Co 1846-62 S. Kilbourn Ave Chicago

a 2316
Cont. Frank Cody
986 S. Pennsylvania St.
Denver - Colo



Pit House of Early American Tribes, Entered through Burrow as Shown in Top Photo; Archæologists Checking Measurements, Below

HOW FIRST AMERICANS LIVED IN UNDERGROUND PITS

Nests for beds in underground shelters, constructed by American tribes between 1800 and 500 B. C., have been unearthed by archæologists of the Smithsonian Institution in the Arizona and New Mexico ruins. Pits, probably designed originally for the storage of corn, became shelters, and several of the nest beds in these burrows still show the impressions of the bodies that once slept in them. At later periods in the development of these tribes, circular houses were built to a height of two or three feet from the ground and the pits used for burial and as refuse dumps. It also was found that the earlier tribes had long, narrow heads and were slightly built. Then a new people began to migrate into the territory, a Mongoloid type with round heads, probably from Asia. While the first ancestors were spear throwers, the later types brought the bow, arrow and stone ax.

Washington, D.C.
a 2341

PORPOISES' JAWS YIELD FINEST LUBRICANT

Oil from the jaws of certain kinds of fish is valued highly as a lubricant for aeronautical instruments, watches and other delicate mechanisms. Porpoises and blackfish supply most of this fish-jaw oil which recently has become so scarce and so expensive that a government agency has undertaken a survey of the possible sources. Porpoise-jaw oil is produced by removing the animal's lower jaw and extracting the oil containing blubber which is boiled gently. A single jaw yields about one-half pint of such oil while the porpoise also yields about two gallons of body oil. Blackfish produce about thirty-five to forty gallons of body oil, while the jaw oil averages about two gallons each. Porpoises are caught in nets, and whalers also capture them and the blackfish by harpooning.

a 2388

RUBBER VULCANIZED TO METAL WITHOUT USE OF CEMENT

Through a recently developed process, rubber of any kind can be vulcanized to metal without the use of cement or flux. This method is applicable to any kind of metal and the adhesion is unaffected by extreme temperatures, chemical action, atmospheric conditions or high pressure. Hard, elastic or sponge rubber, or even rubber mixtures containing up to ninety

American Industrial Rubber Co.
St. Clair St. Toledo Ohio

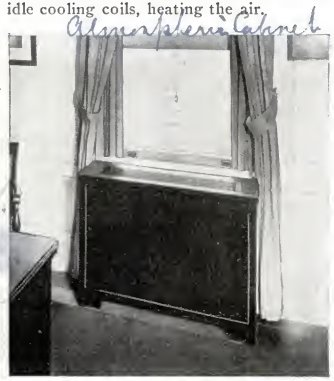
A 2315

per cent of reclaimed stock, can be used. The rubber-to-metal process can be applied to many industrial uses, including the making of rubber-faced pulleys, rubber-tired wheels and for insulation of electrical equipment, etc.

A 2359

WEATHER UNIT FOR HOME KEEPS AIR WARM OR COOL

Conditioned air for the home has been made possible by a weather cabinet which cools and dehumidifies the atmosphere in summer and humidifies and circulates warm air from the heating system in winter. The unit, looking like the ordinary radiator, consists of a series of coils in a case, and two fans which circulate the air slowly. The air is forced from the bottom, over the coils and into the room. In summer, water kept at a temperature of forty degrees, circulates through the coils. The weather unit is connected to a refrigerator or icebox in summer. In winter, the heating-system pipes pass beside the idle cooling coils, heating the air.



Air-Conditioning Coils and Fans in This Cabinet Keep the Home Comfortable



"Bob," Boston Terrier That Has Served as the Model for 100,000 Casts, and His Master Who Produces Them

MODEL OF FAMOUS DOG COPIED HUNDRED THOUSAND TIMES

"Bob," the Boston terrier, that is so widely sold in novelty stores and given as prizes at amusement parks all over the United States, is the model of a real "Bob" who first posed eleven years ago. Recently the one-hundred thousandth cast of "Bob" was completed by the model maker in California. A series of glue molds are employed into which the plaster of paris is poured.

A 2371

SUNSPOTS COOL THE EARTH

Sunspots are like giant electric refrigerators and, when most numerous, reduce the earth's temperature by one degree. The spots, says Dr. Henry N. Russell of Princeton University, become more numerous every eleven years, but for the next three years, the minimum will be reached, almost eliminating electrical interference with telegraph and radio instruments. While the temperature of a sunspot is about 4,700 degrees centigrade, this is 1,000 degrees cooler than the sun's spotfree surface.

¶The liner "Majestic" has a portable dance floor made up of over 200,000 pieces of wood compressed on a canvas backing which can be rolled up.



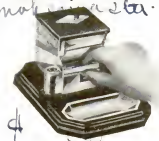
Giant Water-Cooled Tube That Bounces Waves from U. S. to Hawaii, in Right Hand; All the Tubes Are Used in One Sending Station

VOICE BOUNCES OFF UPPER AIR FROM U. S. TO HONOLULU

"Sky waves," rivaling tales of Arabian nights, were shot 200 miles high against the surface of the upper atmosphere known as the Heaviside layer, then bounced down to Honolulu with the opening of trans-Pacific radio-telephone service between Dixon, Calif., and Hawaii. The receiving and sending divisions at each end of the system cost a total of approximately $750,000. The largest tube in the Dixon station has a capacity of 10,000 watts and is water-cooled. Water and air heated by the 10,000 volts necessary to operate the station are cooled by three fans, each three feet in diameter.

LIGHTED CIGARET IS DELIVERED FROM DESK CONTAINER

Lighted cigarets are served singly from a container for the desk or table that includes an electric lighter operated automatically. Contact with the heating element is made when a door is pressed back to bring out the cigaret from the cabinet. As it is pulled forward, it is pressed against the lighter. The cabinet is of bakelite finished in chrome plate, silver or gold, and the outfit includes a snuffer and a removable tray.

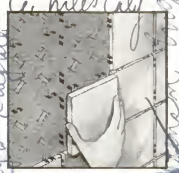


METAL REGAINED FROM ASHES OF SCRAP

Like the packing plant that utilizes everything but the pig's squeal, the General Electric company recovers most of the metal from the ashes of its scrap incinerator. The ashes are pulverized, then run over a magnetic separator which removes the magnetic scrap from the non-magnetic material, such as brass, copper and aluminum. The residue is passed over a grooved concentrating table with a stream of water flowing crosswise, which washes into the grooves the heavier metal and throws off the ashes. By this method about 100,000 pounds of ashes are ground and washed, and from 20,000 to 25,000 pounds of metal and other material recovered. This is worth about $16,000 a year.

TILE THAT SNAPS ONTO WALL AND FLOOR SAVES LABOR

Time and labor are saved and the debris that usually litters the kitchen or bathroom undergoing remodeling is obviated by means of a metal lath which allows the tile to be literally snapped on the wall and floor. The lath is a punched sheet of metal with special mechanically formed fingers, or grippers, projecting at right angles. These provide a frictional grip to the tile material and center it in a predetermined position on the wall. It is said the new system gives the tiling job a structural value which merely pasting it on does not afford, all at a lower cost.



a2270 Cont. No B Schnapper,
2340-63rd St
Brooklyn, NY

A GIANT'S TASK-



Cleaning Statue of Liberty

WHEN a small army of men set about to overhaul and clean the statue of Liberty, they faced a task equal to one of Hercules', but where he solved his problem in a jiffy by turning the Alpheus river on the Augean stables, it's not as easy as that in actual life.

Yet miracles were performed on the statue—miracles far surpassing any of those achieved in mythology. That small army of men turned all the known forces of science on this largest of all statues. They performed miracles which are not here and gone in the wink of an eye but remain for all who enter New York harbor to see. In truth, they were not real miracles—of course not. They were the



Looking Down from Torch of Statue of Liberty, and Statue Illuminated at Night



height of twentieth-century achievement.

For forty-five years the statue has stood in New York harbor. But during these years the reception of Miss Liberty has been palpable only half of each day. During the other half the great bulk, towering above little Bedloe's island, has been only a misty mass at a distance of a few hundred yards. What light she had was very small indeed.

But now Miss Liberty proudly stands as the world's greatest statue twenty-four hours a day. Today there is no statue or structure anywhere that equals her in height, light and massiveness. Indeed, now she is a more marvelous sight by night than by day. After dark, the huge shining figure illuminates the entire harbor, and is visible twenty miles away.

Her new floodlighting system of about 500,000 candlepower is enough to light 250 homes. According to the Westinghouse Electric experts, the "rejuvenation" of the statue entailed some of the most complicated problems ever attempted. It was only after hundreds of experiments and months of work that a successful floodlighting system was installed.

An entirely new feature of the giant statue is the effect of a sparkling crown which gives the world-famed lady a regal appearance. This was made possible by the installation of specially made lights in each of the twenty-one windows of the crown of the statue. A blinker system creates the impression of glittering jewels.

While under the old lighting system the statue looked some-



Above, 115-Foot Spiral Stair Leading to Head of Statue; Below, Mystery Prison Found beneath the Figure

a 22 70





Top Photo by U. S. Army Air Corps

Above, Aerial Photo of Statue Made at Night by Glare from Flashlight Bomb; Below, Guard Climbing Inside of Arm to Torch

what clean in parts at night, there was hardly a clean spot on her in broad daylight. After many complaints had been filed with the government, a committee of experts were told to devise some method by which the statue could be scrubbed. Soon thereafter little black spots—hired men—were seen traversing the wide and dangerously curved expanse of the statue. High-pressure hose and steam brushes were of little avail against the incrustations of dirt. Electric washers were called into use.

Next came the problem of "sewing" up Miss Liberty. Time had battered, frayed and cut through her gown, and there were about a hundred holes. Her jaw and cheek looked bullet-riddled.

The method of repair was long and laborious. Those plates in which there were the most perforations, or those that had been worn thinnest, were removed. These were used for patterns for new plates, because every plate on its interior corresponds exactly to the exterior.

And then Miss Liberty was presented with a brand-new elevator and an automatic switch. This turns on the lights at dusk and cuts them off at dawn.

K. W. Jiffy Co
Lancaster Pa.
a 2233



Valve Grinder with a Rubber-Tipped Vacuum Cup in Which the Abrasive Compound Is Placed

RUBBER-TIPPED VALVE GRINDER IS EASY TO OPERATE

Grinding valves is now accomplished with a tool made of rubber instead of high-tempered steel. The rubber valve grinder consists of a cylinder, at each end of which is a suction cup. The grinding compound is placed in the cup and the tool is revolved between the palms of the hands.

HOW QUEER GOODS ARE SHIPPED

a2293

New types of commodities are constantly coming on the market, bringing to the railroads and shippers new problems of handling to avoid loss or damage. Neon-light sign tubes required considerable experimentation before a way was found of transporting them without breakage. The extremely fragile tubes finally were fastened to frames of chicken wire, which in turn were suspended by strips of rubber inside a solid box. This method eliminated most of the shock of handling before it affected the tubes. Live snails also taxed the ingenuity of shippers for a long time. Now, specially constructed cans, filled with water in which the snails lived before they started traveling, are used. The shippers also pay to have these containers returned, since the usual rough handling of empties would ruin the cans. Live fishworms, water plants, dynamite, gas and large radio-broadcast tubes are among other items for which special methods of packing have been devised.

a2280

TOP FOR AUTO RUMBLE SEAT IS COLLAPSIBLE

Protection for riders in rumble seats of autos is afforded by a collapsible top which allows easy access to the seat and folds out of the way when not wanted. It consists of a metal frame that folds like a jackknife, a waterproof cover and a back curtain. Cover and bows fold separately to prevent wear on the fabric. At the rear, the top is held by one center standard attached to the back of the seat. This standard telescopes so the top can be raised before entering or leaving the seat. The top can be installed in fifteen minutes and, once in place, can be removed or replaced in three minutes.

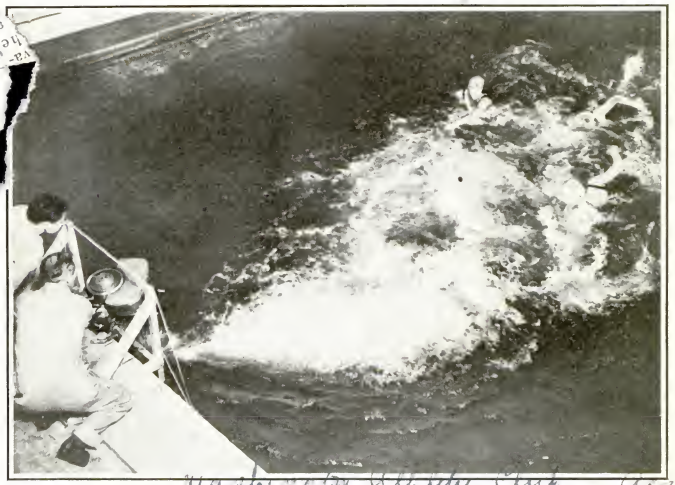
Hollywood Mirror Bill



Collapsible Top for the Rumble Seat, Supported at Back by a Telescoping Standard So Top Can Be Raised as Passengers Enter or Leave

Mr. H.K. Sudowski
c/o Scranton Republican
Scranton Pa
National Auto Top & Jiffy Co
3900 Pharmita Ave
Los Angeles. Calif

a2330



Creating Artificial Current in a Pool with an Outboard Motor, to Train Swimmers for Open-Water Competition; the Swimmers Fight the Current by Splashing Toward the Motor

OUTBOARD IN SWIMMING POOL HELPS TRAIN RACERS

Swimmers training for open-water competition in the narrow confines of a pool often are handicapped because the water is still while in an actual contest currents may play an important part. The coach of a Seattle team solved this difficulty by creating an artificial current in the pool with an outboard motor. This motor was placed at one end of the pool to churn up the water, and the practicing swimmers fought their way against the current by proceeding toward the motor.

DIRECTION FINDER FOR STORMS TESTED FOR NAVY

a2354

Hurricanes and other weather disturbances in the Caribbean sea and the Gulf of Mexico may be tracked down, and all shipping and air traffic cleared from their paths through a static direction finder developed in the U. S. Navy department. The instrument is being tested and, if found satisfactory, installations will be made at four points in the Caribbean area. By means of the direction finders, bearings will be taken to locate the centers of static associated with hurricanes and thus trace the course of the storms. Advance warnings to ships and airplanes in the path of the hurricanes would be possible.

a2336

ELECTRIC HEATER ALSO COOLS WITH ICE WATER

Warm or cool air, as required, is circulated by a small portable electric air conditioner for the home. In emitting warm air the unit operates like any other electric heater, but when used as a cooler, a radiator inside the metal case is filled with ice water and the switch turned to the cool position. Operating in this manner, the conditioner circulates a stream of air cooled by the ice water.



Latest War Tank at Home on Land or Water



Views of Amphibian War Tank in Water and on Land; It Has a Land Speed of About Forty Miles an Hour

Water offers no obstacles to an amphibian war tank recently tested in England, for it can speed over the ground at forty miles an hour, then plunge into and swim across any river in its path. It is virtually a combined land and water battleship, for when in the water a steel turret containing small guns protrudes above the surface, so it can attack as it swims. A small propeller gives the tank a speed of about seven miles an hour in the water, while on land it can lumber over five-foot ditches with vertical banks, climb a steep grade at six miles an hour, or race across flat country at forty miles. The land-water tank was evolved after a satisfactory method was found for making elastic water-tight joints. Several years ago, an amphibian tank was tried out, but it sank, due to the development of leaks in its non-elastic joints after rough cross-country travel. In actual warfare, such weapons may revolutionize defense tactics, since forces guarding river banks and bridge heads are robbed of the temporary security offered by deep streams, as the tanks can span such obstacles quickly and are proof against armor-piercing bullets, even at 150 yards. In the water, only the turret and two float-mudguards are visible, while on land its appearance is similar to that of the ordinary army tank.

CLUES TO PREHISTORIC PEOPLE SOUGHT IN DEATH VALLEY

Evidences of prehistoric occupation are being sought in Saline and Death valleys in California by an expedition of scientists representing two California museums. A detailed survey is being made of the region, long regarded as always uninhabitable, on a theory that Death Valley may at one time have been the habitat of a tribe of Indians. In the northern part of the valley, various ancient Indian remains are said to have been discovered from time to time.

ELECTRIC EYES FOR AIRPLANES "SEE" THROUGH FOG

Fog, one of the greatest handicaps of the aviation industry, may be overcome by equipping airplanes with electric eyes, or photo-electric cells. Experiments conducted by the General Electric research laboratory indicate that such an eye in an airplane can penetrate dense fog and "see" beacons on the ground entirely invisible to the pilot, thus enabling the pilot to hold his course or find a landing field. The operation depends on the fact that the photo-electric cell is very sensitive to diffused light, and all light passing through fog is diffused. To make sure that the electric eye picks up only beacons, and not any light on the ground, it is suggested that the beacons be fed with a 1,000-cycle current to give a rapidly flickering light. Since ordinary lights use either a sixty-cycle or direct current, it will be possible to isolate the 1,000-cycle signals. Even in full moonlight, it is claimed the eye can detect a diffused modulated light of an intensity only one thirteen-thousandths that of a diffused flashing light just visible to the eye.

GAS SUPERCHARGER FOR AUTOS INCREASES MOTOR POWER



Motor power can be increased and the carbon knock eliminated in automobiles by installation of an inexpensive supercharger. Gases going to waste through the exhaust pipe are put to work by the supercharger, which is automatic, to give an improved carburetor mixture. Increased mileage from gasoline, quicker warming up of motors and smoother operation are among the advantages claimed for the attachment, and low-grade gas can be used.

¶Two light garments for winter wear are warmer than one heavy garment, for much the same reason that a double wall insulates a building from the cold.



These Molds for Children Will Make a Whole Menagerie of Clay; the Figures Can Be Baked

ANIMAL MOLDS FOR CHILDREN MAKE CLAY MENAGERIE

Animals of clay are easily molded with an educational toy recently introduced. The molds come in fitted pairs so that a complete animal can be formed in one operation. The clay simply is placed in one half, and the other half pressed on top. The figures can be baked for half an hour in the oven and colored.

SELF-ADJUSTING CASTER FITS ANY PIECE OF FURNITURE

Adjusting itself to rough floors, a new caster is now on the market. A spring which is inclosed between two metal cups is the secret of the self-adjusting ability of the caster. Any piece of furniture is kept steady on uneven surfaces, the wabble being prevented and the unsightly use of wads of paper or chips of wood to avoid tilting is eliminated.



a2259

MANCHURIA



Above, South Manchurian Railway Yards at Dairen; Below, a Japanese Soldier

By UTHAI VINCENT WILCOX

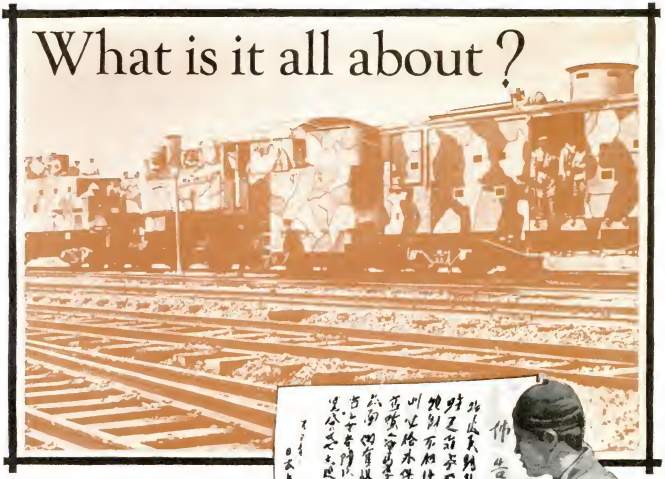
TO understand the situation in the Far East, the South Manchurian railway must be considered first. This is no strangling narrow-gauge trackage stretching across the steppes. It is a thoroughly modern, adequate, forward-looking railway. The equipment is American, the track is standard, the cars and locomotives are American-built and of the latest type.

Japan owns this railway. It is operated with government funds. It is Japan's contribution to the development of rich and wealthy Manchuria, which embraces the three eastern provinces of China—and is about equal in size to Texas, New York and Pennsylvania combined. Its soil generally is of almost exhaustless fertility, and it possesses immense potential resources in agriculture, timber and mineral wealth. Along the lines of the South Manchurian railway, there are modern flour mills, bean-oil mills, soap works, sugar refineries, sawmills, distilleries, breweries, glass factories, tanneries and ore mines.

Thirty years ago, Manchuria had no railways and its population was less than 2,000,000. Today its railways total nearly 4,000 miles, or about as much as the whole of the rest of China, and the population, according to recent estimates, is over 27,000,000. Railway development has brought into Manchuria probably the greatest colonization movement that has ever taken place in history, in an area of similar size

a 2259

What is it all about?



and in a similar length of time. In one month, recently, approximately 200,000 immigrants passed through the Southern Manchurian railway controlled port of Dairen. These are permanent colonists. On Sept. 5, 1905, the Japanese government, by virtue of the treaty of peace between Russia and Japan, acquired the railway main line through Manchuria from Changchun to Dalny and Port Arthur, together with its branch lines and all rights and privileges, including the coal mines formerly owned by the Chinese Eastern railway. It will be seen that Japan is intensely interested in Manchuria by reason of its railway lines. It would be comparable to the ownership and control of one of America's transcontinental lines by a European power which sought to develop every railway interest even to ports, mines and factories along its right of way.

Dairen is the terminus of this modern railway of the East. In the early days the Chinese had a name for the town which meant "Black Mud Hollow"; then the British and the French made it a base of operation when attacking Peking, and later it was leased to Russia. The Japanese were quick to realize its possibilities; in fact, quicker than the Russians had been. They abandoned Port Arthur, not far distant, and concentrated on Dai-

Camouflaged Japanese Armored Train, and Chinese Civilian Reading Proclamation

a2259







ren. They changed the name to the present one which, literally, means "great connection."

The South Manchurian railway operates steelworks, collieries, waterworks, electric plants, gasworks, building projects, laboratories and experiment stations; and, according to one of its official bulletins, "city building and administration." It even goes farther than that; it conducts schools, hospitals, hotels, banks, clubs, bureaus, and so forth, until there seems to be no end to its undertakings.

But the railway is interested in more than mere transportation. First, there is the famous Fushun colliery. This great coal mine, or rather series of mines, is but twenty-two miles southeast of Mukden. The mines are remarkable for the thickness of their seams. The daily output at present is 20,000 tons, with a conservatively estimated potential output of 1,200,000,000 tons.

Top, Wharves at Dairen; Center, Map of Manchurian Railways; Below, Partial View of Anshan Steelworks

a2259



Top, Japanese Troops Halting a Train of the Manchurian Railway to Search for Chinese Troops Believed Concealed in It; Right, an Armored Car Used by the Chinese during the Manchurian Fighting; Note the Camouflaged Effect; Below, a Peaceful Scene along the Route of the South Manchurian Railway; Chinese Pottery Makers at Work





a225-4



may soon rival all others east of Suez. The Japanese themselves claim that the future source of steel in the Far East is located at Anshan. The railway acts as the godfather to these factories and to the extensive mines of iron ore. There are several blast furnaces in operation with an ultimate annual production of 1,000,000 tons in sight.

It would be tiresome, perhaps, to note in detail the long list of industries operated in that ancient land. Such a list includes coke ovens, sulphate-of-ammonia factories, gasworks, libraries, technical schools, playgrounds and bean mills. There is a medical college (Nanman Igakudo) which should be included.

The school work of the railway is another evidence of the vision of the owners. In order to encourage education among the children, the railway grants free passage to those who attend schools along its right of way.

The laboratories, operated by the technical staff of the railway, are now developing native crafts to compete with western ways. Studies are being carried on in the dyeing and weaving industries, in silk filature, in ceramic art, in methods for manufacturing salt, glass, pulp for paper from Kaoliang stalks, analyses of coal and iron ores and experiments in the possibilities of the soya bean.

Then there are the great Anshan steelworks. American engineers estimate that these works



Above, a Regiment of Japanese Troops Leaving Korea for the Front; Below, Japanese Machine Gunners in the Streets of Mukden

a2363 dmvs/c. Roy Hunter
Robert Pierce

c/o Universal Pictures Corp

Machine Replaces Men in Developing Film

Universal City, Calif



Continuous Movie-Film Developer That Will Develop Twelve Reels of Negative at a Time, Drying and Winding It Ready for Printing

Developing 12,000 feet of film in one continuous motion, an electrically driven apparatus has recently superseded man power in the laboratories of many of the large motion-picture studios. In the space once needed to dry 600 feet of film now can be installed six of the machines, each capable of handling 12,000 feet. Better control of solution temperature and the elimination of dust that scratches the negative are additional advantages. Each machine has a capacity of thirteen 1,000-foot magazines, one of which carries test film. The leaders are attached and the thirteen strips of film are drawn through developing solution, hypo, water and drying compartment at the rate of six feet per minute. The developer and hypo circulate constantly, keeping the solution to strength. After drying by hot air, the film is wound on reels. The test film is available for checking at any stage.

a2329

BOOK PROP FREES HAND WHILE YOU READ

Made in a variety of colors, a folding metal book prop has been introduced that frees both hands while you read. A flexible knee clamp is provided which allows the reader to recline in almost any position with the book held open and the hands free for use in smoking, eating or writing. It also can be employed effectively in the sick-room where it allows the patient to keep his arms and shoulders covered. It will hold any size book, magazine or sheet of music, and is useful in sketching. The book is held so that the wind cannot blow the pages, making it an effective adjunct in outdoor pleasure.

Cardinal Book Prop



Four Handy Ways in Which the Book Prop That Frees Both Hands Is Effective

Chas. Discher Spring Co. 242 Fort Ave
8 8. Walker Brooklyn. NY

a2365

Carrier Pigeons Take Photos Automatically



Pigeon with Automatic Camera Strapped to Breast, and Pictures Taken by a Bird in Flight

Carrier pigeons in Germany are being used to make aerial photographs by means of tiny automatic cameras, which operate while the birds are in flight. Two hundred views can be taken by such a camera on one flight, the shutter starting to click only after the bird is in the air. Pigeons are trained at a special government school for this work, as well as for carrying message tubes which are attached to their legs while the camera is strapped to the breast.

a2441

INEXPENSIVE CLOTH IS MADE FROM CHINA GRASS

Ramie, or china grass, the oldest and strongest vegetable fiber known, is being made into yarn from which is produced fine linen under an inexpensive purifying process. Paper manufactured from the pulp resists all testing machines. Because it is stronger wet than dry, retaining all its original strength when dried again, ramie is said to be superior to yarns made from other fibers, including flax. Experiments show that brake linings of this material will resist heat better and last longer than cotton and asbestos linings. Ramie, belonging to

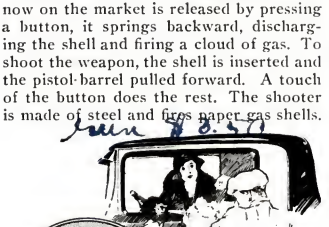
the nettle family, will grow anywhere cotton grows, and Louisiana bankers are interested in its production in that state. Ramie has been used from time immemorial, the Egyptians wrapping their mummies in it, but the laborious process of removing the impurities has made the cloth too costly.

SAND NOZZLE HAS LONGER LIFE AND NEEDS NO COUPLING

Much of the expense and time lost in changing nozzles used by sand blasters has been cut by a new nozzle made of a more resistant alloy and having no heavy coupling. Whereas the average nozzle lasts from twenty minutes to an hour in constant service, the new one is guaranteed to last eight hours. Finer work is possible by lengthening the nozzle to seven inches and reducing the weight added by the coupling. The new nozzle slips inside the hose and is fastened by a clamp. A special alloy resulted from more than a year of experimentation, which is able to withstand much greater amounts of the sand forced by high air pressure through the outlet orifice.

TEAR-GAS SHOOTER FITS HAND AND PROTECTS OWNER

When the barrel of a tear-gas shooter now on the market is released by pressing a button, it springs backward, discharging the shell and firing a cloud of gas. To shoot the weapon, the shell is inserted and the pistol-barrel pulled forward. A touch of the button does the rest. The shooter is made of steel and fires paper gas shells.



Recoil of Spring Barrel Fires Cartridge of This Tear-Gas Gun; Note Button Trigger on Top

GAS PUMP IN SHAPE OF SPHINX DRAWS ENGLISH TRADE



Gasoline Flows through a Hose in Mouth of Sphinx, with Which This Filling Station Is Decorated

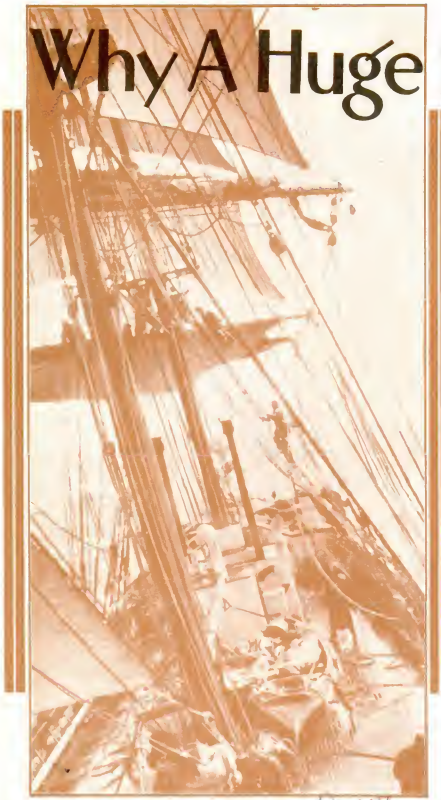
English motorists have been attracted to one filling station by a gasoline pump in the shape of a Sphinx. The rubber-hose pipe runs through the Sphinx' mouth to the automobile tank.

CROPS HIGH IN VITAMINS URGED TO SOLVE FARM PROBLEMS

Crops high in vitamins are urged by Dr. Walter Hough, of the National Museum, Washington, D. C., as the solution of the farm problem. Production of efficient foods would eliminate the farmers' burden of raising needless crops, says Doctor Hough, who would have the farmer concentrate on limited, more valuable crops, saving labor and giving him more leisure. Under such a condition, a census of farm products in demand and the supply would be necessary to get a proper correlation. This infers a control of acreage put into crops, and suggests a concentration of effort on the best lands for certain crops, thus getting the diversity of required products in the best localities and throwing unused lands into forests.

a2368 Capt. Thos. W. Sheridan Little Neck L. I. Newport

Why A Huge LINER

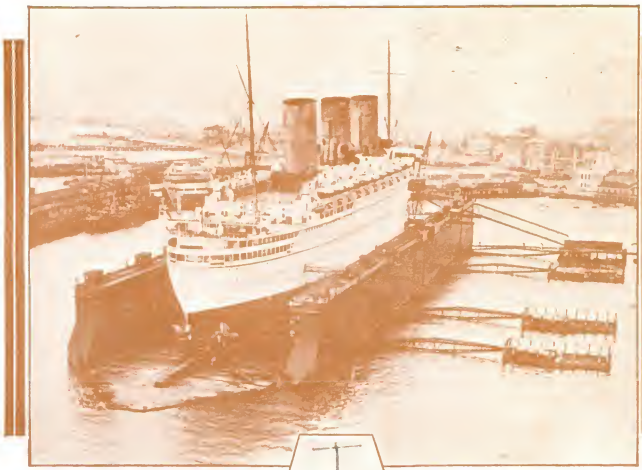


An Old-Fashioned Windjammer in Dirty Weather; the Vessel Is the Full-Rigged Clipper "Seven Seas," Formerly a Swedish Ship

By CAPT. THOS. W. SHERIDAN

MANY mysterious accidents and curious actions of steamships under way, which in the past were ascribed by superstitious seamen to supernatural causes, are now known to be the result of the action of simple hydrodynamic (water pressure) phenomena. "Suction," "smelling the bottom," "sucking the bank" and "squat" are all seamen's terms for various manifestations of this kind. Twenty years ago, a curious catastrophe, at first apparently inexplicable, resulted in an admiralty action which drew the attention of the world to the existence of suction between moving ships. The giant "Olympic"—then the new marine wonder of the world—was bound out to sea from Southampton and had turned to go out through the Nab. The cruiser "Hawke" was steering along on a course parallel to the "Olympic's." The "Hawke" had come up from astern and was overhauling the "Olympic." Its bow just passed even with the "Olympic's" stern when suddenly, as if pulled in by the irresistible attraction of a monster magnet, the "Hawke" sheered in toward the "Olympic." The rudder was put hard over to stop the sheer and the engines backed, but in spite of all efforts, the "Hawke" cut a great gash in the liner's starboard quarter.

Since then, there have been many other accidents, due to apparently eccentric actions of ships, that made many "Salty Solomons" shake their heads and agree with the "Singing King" that it was indeed hard to understand "the way of a ship in the sea." Sometimes these occurrences were due to the suction between two ships, sometimes a ship would suck the bank on



Runs AMUCK!



"Empress of Britain," Top, and "Mauretania," Below, in Floating Drydocks

one side of a channel and sheer right off into the middle of the stream against its helm with disastrous results to itself or anything in the way, or there were cases of a ship becoming uncontrollable due to smelling the bottom when going too fast in shoal water. Although frequently incomprehensible to the puzzled persons involved, these things are very easily explained.

A moving ship cuts a lane, so to speak, through the water. The fluid ahead is pushed out of the way in a direction perpendicular to the shell of the ship at point of contact—ahead, down, right, left. Astern, the water rushes in to fill the cavity. It is the currents caused and pressure differences created by the transportation of the vast mass of fluid moved by the progress of a ship that cause these hydrodynamic phenomena.

Every time a ship under way has progressed a distance equal to its own length, it transposes a mass of fluid equal to its own displacement in weight and volume—that is the actual weight of the ship in pounds or tons and its underwater volume. Thus even a small freighter of 10,000 tons' displacement, of the average length for a ship of that size of 375 feet, going at the moderate speed of ten knots, will push out at the bow and suck in at the stern a weight of water of 26,666 tons every minute.

Obviously, any object in

a2368





Above, Drydocking the "Majestic"; Below, Diagram Showing Forces Causing Collision of "Olympic" and "Hawke"

the path of the current of this vast moving mass of water will be affected by it. Near the bow the object will be repelled from the ship and at the stern it will be sucked in toward the ship. Between ships this suction effect is at its maximum when the bow of one ship is abreast of the stern of the other and collisions are most likely to occur when one ship is overhauling another and its bow has just become even with the other's stern, which is what happened in the "Olympic" case.

Towed or sailing ships do not show the intense suction action at the stern that steamers do. The propeller in the latter shoots the water back and thus increases the cavity at the stern. On account of this strong back push, the inflow must take place entirely from the sides and up from the bottom. This increases the strength of the inflow over what it would be if there were no propeller.

Sucking the bank frequently occurs in narrow, shallow canals or channels. In this case, the bow is repelled and stern attracted by the nearest bank on one side of the ship's course. The outward flow of water, being impeded by the bank at the bow end, and the inward

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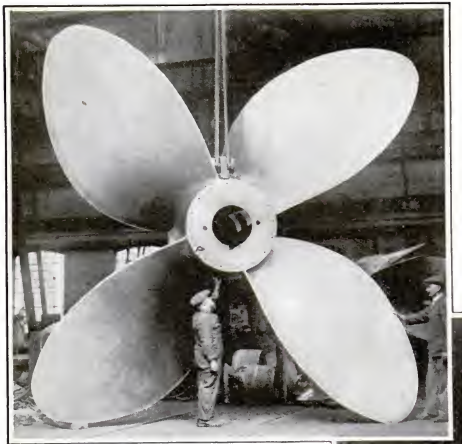
Above, "Aquitania" Battling Mountainous Seas; Below, Diagram Illustrating Bank or Shoal Suction

flow reduced at the stern cause a pressure to be built up forward, and a suction (reduced pressure) at the stern, on the bank side. The result is that the ship turns away from that side and sheers out into the middle of the stream, on account of this twisting effect.

During the war, the writer had a curious experience of bank suction. Toward the end of the war, it was the custom to sail the convoys in the daytime in the English channel and to hug the shore as closely as possible in order to frustrate submarine attack from the shoreward side. On one such occasion the writer was in command of the last ship in a column. Suddenly the first ship took a broad sheer to port and, in sequence, the whole column seemed to run wild. At first we thought it was an attack and then the same thing happened to the writer's ship in spite of the rudder. The explanation is that we had suddenly entered into shoal water with a pronounced bank on our starboard hand.

It is probable that the ship's sheering was not due to bank suction alone, but that the smelling-the-bottom characteristic of ships in shoal water had its effect. Due to the impediment to the free flow of

Q2367





Above, Propeller of "Empress of Japan"; Right, "Olympic" after Collision with the "Hawke"

water into the cavity, left by the ship, caused by the proximity of the bottom, all propelled vessels steer wildly when proceeding at any speed in shoal water.

Twin or multiple-screw vessels steer and sheer wildly when smelling the bottom, but they do not favor any particular direction of sheer. On the other hand, single-screw ships nearly always sheer to the left of the course when this occurs even if the sea bottom is level. This is due to the fact that the propellers revolve right-handed—the same as the hands of a clock—and thus the water is sucked in on the lower starboard (right) side and expelled on the lower port hand. By impeding the inward and outward flow, the proximity of the bottom builds up a pressure on the port side of the stern and reduces it on the starboard side, and the twisting effect causes the stern to go to the right, which, of course, turns the bow to the left.

Squatting is another disconcerting manifestation of hydrodynamics which worried the minds of mariners in the first days of steamships, and often does yet. It is the tendency which ships have to sink down in the water, at the stern, as they speed along. It is due to the reduced buoyancy of the water owing to the stern cavity. While all ocean ships have this tendency on account of being deep and narrow, some shallow and broad boats have the opposite tendency and actually hydroplane to a certain extent.

In close and shallow waters the squatting tendency is increased and ships navigated by the unwary at high speeds, bump on the bottom in places where the water is several feet deeper than the ship's draft. Some years ago, the writer was present at experiments off Robbins reef to determine ships' squat. At eighteen knots, the American liner "New York" squatted over seven feet by accurate observations.

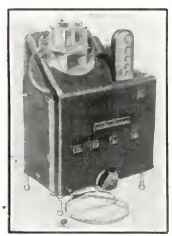
N.Y. Times 12/6/31

BIG DYNAMOS RUN IN HYDROGEN TO CUT WIND LOSSES

While big dynamos are highly efficient, often delivering as much as ninety-seven per cent of the power input, a means recently has been found to make them even more so, by running them in hydrogen instead of air. Resistance of air in a 100,000-kilowatt unit may be as high as 900 horsepower, while operating it in an atmosphere of hydrogen, which is more tenuous, adds about one per cent to its efficiency. The method has been adopted only in the case of very large units.

FARE BOX ALSO MAKES CHANGE ON BUS OR STREET CAR

Fare boxes for busses or street cars that also make change relieve the operators of the responsibility of handling the passengers' money. To obtain change, the rider drops his coin in one of several slots taking from a nickel to a dollar. He or the operator then presses a button that causes the change to drop into a hopper. The passenger deposits his fare in another hopper at the top of the machine, and the operator presses a second button which drops the fare into the interior of the box and registers the amount. The only responsibility of the operator is in changing paper money. He can accept a dollar bill and press a lever which causes the fare box to issue a dollar's worth of change. The same operation records the fact that the conductor or driver has accepted the bill, charging him with whatever amount of change is issued. Coins dropped into the device are automatically segregated according to denomination.



ELECTRIC ICE-CREAM FACTORY WILL FIT IN SMALL SHOP

Requiring no more space than a large refrigerator, an electric ice-cream factory is now on the market, designed especially

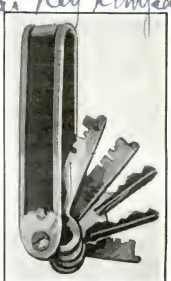


Here's a Whole Ice-Cream Factory in a Cabinet; It Produces Five Gallons at a Time

for small shops wishing to produce their own cream quickly and economically. The miniature factory consists of refrigerating unit, ice-cream freezer, an agitator in which knives and paddles produce a double mixing motion, and the hardening compartment. All parts are inclosed in or attached to a cabinet resembling a refrigerator. The makers say that the double mixing motion of the agitator results in a "super-creamed" product. Five gallons of cream is the capacity of the freezer.

AUTO KEYS FOLD INTO HANDLE OF POCKET HOLDER

Ignition, tire and door keys of your automobile may be carried in a pocket holder now on the market. The holder has a hollow handle into which the keys are folded. The over-all length is three inches, while there is space for your name or advertising available on each side.





Long Experiments Led to a Process for Engraining in Wood Portraits Which Will Not Fade

PORTRAIT ENGRAINED ON WOOD WILL NOT FADE WITH AGE

Portrait making on wood has been developed by a California artist who follows the grain of the wood in bringing out the lights and shadows necessary to produce a picture. The artist, who has worked thirty years on the process, says the wood-grain portraits will not fade. The process calls for working the portrait into the grain so that it becomes part of the wood and can be removed only by scraping or cutting the surface.

"ELECTRIC EYE" IS PAINLESS TIME SAVER

Man is being released from routine work by application of the photo-electric cell to the meaner services of seeing, says Dr. Willis R. Whitney, of the General Electric company. The tube, known as the "electric eye," is much more accurate and sensitive than the eye of man, it can keep uninterrupted watch for hours at a stretch, it can measure hundreds of things, including light, more accurately than human operators, and it can see light rays entirely outside the range of the human eye. These rays include the ultraviolet, infra-red and X-ray. Doctor Whitney sees the eye as a painless process of saving time, releasing man from mere routine to engage in other pursuits. The photo tube can be standardized and calibrated. It can fix its attention exclusively upon one spot in a glowing furnace just as well as upon some distant star, helping the steel treater or the astronomer. It will not grow tired and it will not wink, proving its superiority over the human organ.

TALKING PLANE FIGHTS REBELS WITH WORDS FROM AIR

Aerial broadcasting apparatus has been installed in a British transport plane for use among the tribesmen of Iraq. Authorities believe that the effect of a voice from the sky may serve to disperse the natives in rebellion. It is also felt that spoken warnings, issued in booming voices, will have much greater effect than leaflets dropped among the villages. It is hoped that the new means will subdue revolts without having to resort to more forceful methods. The apparatus installed amplifies the voice more than a million times and makes it possible for a speaker to be heard plainly from altitudes of 3,000 to 4,000 feet.

RUBBER BASE FOR UPHOLSTERY TAKES PLACE OF SPRINGS

Sponge rubber made directly from latex is being employed in place of hair and spring filling in a new type of upholstery. The rubber sponges are molded in tiers, slabs or honeycomb forms and can be bottomed to a diaphragm consisting either of sheet rubber or interlaced strips, mounted on a steel frame. Unusual comfort and resiliency are claimed for the method.



Chair Samples Upholstered with Rubber Base Instead of Springs; Many Forms Are Possible

Cpl. Thos E. Stimson, Jr. 1465 S Spring St. Los Angeles. Calif
a2305

Yucca Breakaway Furniture Is Used in Movies



Wood That Weighs Only Half as Much as Balsa Makes Those Properties That Break So Easily in the Movies

Motion-picture comedy actors who fight with chairs and other implements use "breakaway" furniture made of wood that is so light it never hurts. A club may shatter realistically over a comedian's head, but he hardly feels the blow. Guns and hammers that appear to be dangerous weapons on the screen actually weigh only a few ounces. The lightest material that the studios can obtain for this furniture is the pith of the picturesque yucca, otherwise known as the Spanish bayonet. Scouts are sent into the southwestern desert to gather the stalks, some of which are thirty feet high. The pith of the yucca has the same texture as heavy wood, but it weighs only half as much as balsa. A block of it can be crushed easily in the hand, yet it is sturdy enough to cut into thin boards and make into such articles as tables and pianos. Otto A. Oie, Hollywood's master carpenter of breakaway furniture, makes up realistic chairs that weigh four or five ounces and that can hardly be distinguished from their sixteen-pound originals. Large pieces, such as chair legs and rungs, are held together with toothpicks. Smaller pieces are glued.

Calif. St
469 W

Science Service 12/7/39

HOME AIR FILTERS TO RELIEVE HAY-FEVER VICTIMS

a2497

Air filters to help victims of hay fever soon will be available for installation in homes. Experiments at the University of Illinois have shown that filtered air relieves the malady in from thirty minutes to one and one-half hours, permitting sound sleep. Use of filtering machines in bedrooms would relieve a large percentage of the 2,500,000 to 6,000,000 hay-fever sufferers in the United States, since they would be exposed to irritating pollen only during the day. In one ward at the university hospital, 100 persons were observed. Most symptoms were relieved shortly after the patients entered the ward after their customary activities during the day. However, the relief was not complete, as most of them had a mild attack in the morning on awakening. Improvement in the filtering process is expected to give better results.

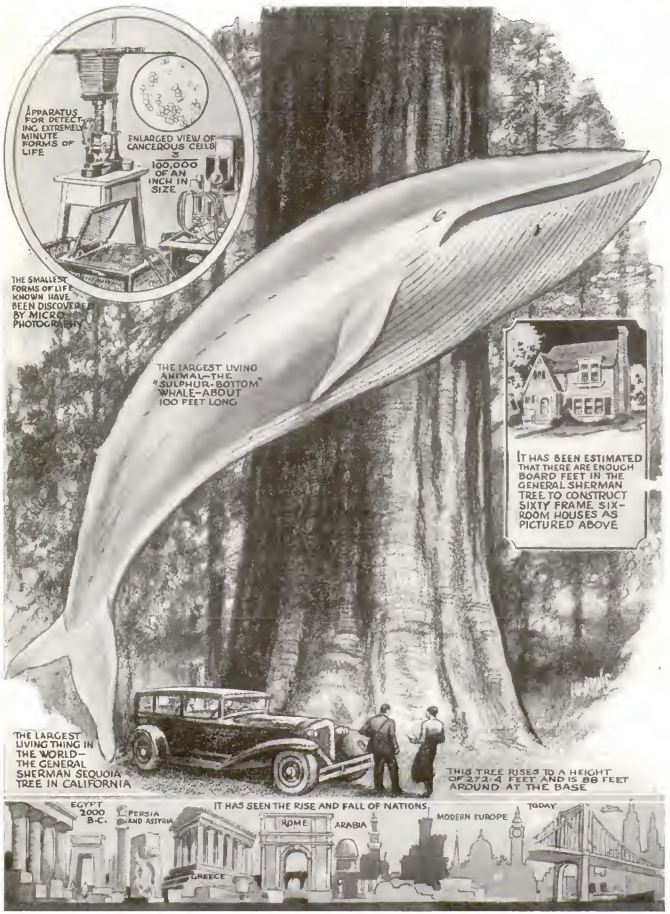
Dr. William H. Welker

Dr. Ben J. Rappaport

Mrs. Jell Nelson and Research Hospital, Univ. of Illinois Urbana, Ill.

a243.2 Logan U. Reavis
55 W. 42 nd St.
New York

The Largest and Smallest of All Living Things



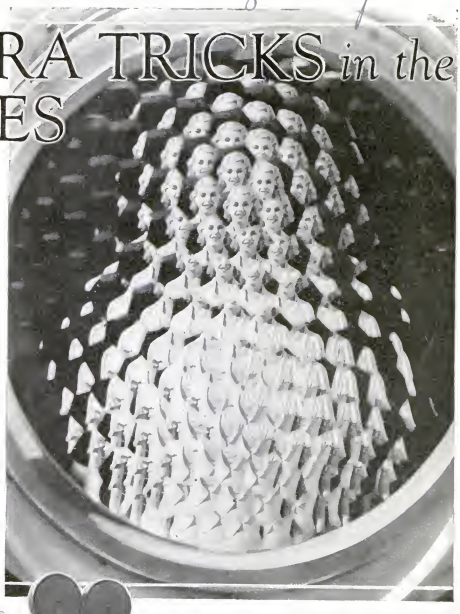
Precise Measurements Have Established the General Sherman Tree as the Largest of All Living Things, and Probably the Oldest; Cancerous Cells Are the Smallest Known Forms of Life

A2155 Cmdr. Andrew R. Boone,
613 Spreckels Theatre Bldg
San Diego, Calif.

CAMERA TRICKS in the TALKIES

ACROSS the screen hundreds of soldiers mill about. One hundred and five lenses, opening in front of a single strip of motion-picture film, record the scene. The "button glass" is the newest movie device intended to aid sound equipment in providing further illusions and entertainment.

Many new "tricks" and devices to aid the eye are sweeping the studios. Whereas the button glass revealed several hundred soldiers, in reality there was a much smaller number. Here is how it works: Placed in front of a camera, the button lens causes an individual to look like parts of 105 individuals, small in size, yet separate and distinct. When the lens is revolved, the scene becomes distorted, and the tiny scenes roll and turn over each other.





Above, View of One Actress through the "Button Glass" Which Makes Her Look Like a Crowd; Below, Glass in Place before the Camera

The button glass is only one of the trick devices recently adapted by Lloyd Knechtel, Radio Pictures' trick photographer, to screen use. Triangular mirrors, a crystal ball cut from a doorknob, reflecting lenses, revolving prisms by which airplanes are made to spin without actually turning in the air, contribute to the realistic portrayal of scenes.



Film Strip Showing "Lap Dissolve," by Which One Scene Merges into Another without Abrupt Change

The "lap dissolve" enables the producer to merge one scene into another without abrupt change. Suppose the script calls for a spinning plane to dissolve into a close-up of wreckage. Both scenes are recorded, possibly on separate films in separate cameras at different times and locations. In the laboratory, the last views of the spinning plane gradually are faded and the first few feet of the wreckage are faded. Then the two films are overlapped and double-exposed. The result is a merging of the two scenes.

Another interesting effect has been obtained by shooting through a crystal doorknob. The movies have taken many keyhole scenes, but the doorknob came into use after it had been cut in diamond shape and repolished. The high-grade plate, fitted close against the lens, gives a multiple-image effect.

And now a way has been devised to cause a camera to focus automatically as it backs away from a close-up, keeping both the principal actor and the whole scene in focus.

Suppose the opening shows a star, possibly only the face, and the director calls for the camera to be moved slowly backward. The lens quits staring into the actor's eyes from a distance of one foot and moves back 150 feet on the four-wheeled dolly. As it rolls back, cams and gears regulate the focus automatically to keep the star in his proper proportion to the entire scene.

These tricks of camera and cutting room have enabled the talkies to develop much like a book. The automatic focus represents a paragraph in its effect, while lap dissolves take the place of chapters. And the trick lenses represent literary devices to capture the reader's attention.

READER IS BLIND PART OF TIME AS EYES SCAN PAGES

When you read, you are entirely blind during all but tiny parts of seconds. These periods have been measured by Frank K. Moss, a research engineer for a lighting laboratory, who found that they ranged from seven to fifteen-hundredths of a second. As you read a line, your eyes move and stop at short intervals. While the eyes are in motion they "pick up" the reading matter, but the connection to the brain is shut off. In reading it was found the average person is blind about three-tenths of a second at a time. The eye ac-

N.Y. Herald Tribune 11/13/31 a2285

curately measures this interval, and if you did not pick up what you read in the specified interval, you probably would not be able to read. In conducting the experiments, an accurately timed rotating disk was used. It was painted white and pierced in the center with two parallel slits. How the vision lagged behind the actual position of the parallel slits in relation to the horizontal was made known by the subjects through signals. More than 150,000 measurements were made with varied intensities of light to determine how much light the eyes need for comfort while at work. From these tests, it was estimated they require about thirteen times as much as they get from customary office lighting, which averages in strength that of an eight-candlepower [illegible] on a sheet of paper held a foot away.



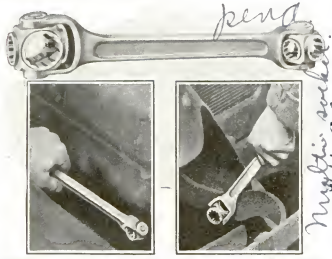
Scientist at a Middle-Western University Testing the "Teletactor" by Which Deaf Can Hear with Their Fingers

DEAF CAN HEAR WITH FINGERS BY AID OF "TELETACTOR"

Totally deaf persons now can hear with their fingers by means of an instrument, the "teletactor," devised by a professor at a middle-western university. The speaker talks into a small microphone and his words are carried through an amplifier into a small receiver or vibrator on which the listener places his digits. With a little practice, the deaf can learn to recognize words and sounds by the vibrations they produce against their finger tips.

/RENCH FITTING EIGHT BOLTS HAS SWIVEL SOCKETS

Swivel sockets in both ends of a wrench now on the market are made to fit eight sizes of bolts or nuts. An index spring to retain the working opening in position allows the wrench handle to be operated at practically any angle. The tool is drop-forged and heat-treated, and is guaranteed against breakage.



Swivel Sockets to Fit Eight Different Bolts Make This Wrench Useful around the Auto

CHAIRS OF METAL MAGNESIUM MAKE PLANES LIGHTER

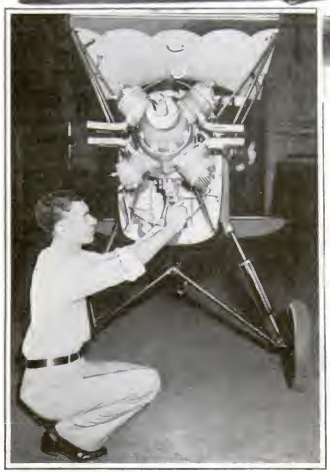
Elektron, an alloy of magnesium manufactured only in Germany and Italy, rapidly is coming into widespread use particularly in the field of aviation. Aircraft builders have adopted it for parts of motors, wings, fuselage and even for interiors. The Lufthansa recently installed chairs and other furnishings of elektron in several of its larger planes. The substance has a specific weight of 1.8, considerably lower than even the aluminum alloys, while it melts readily at between 625 and 650 degrees Centigrade. It oxidizes slowly, and while the white oxide formed on the outside of the metal does not impair its strength, in aviation employment a brass paint usually is applied for a protective coating. It has also found favor in the manufacture of cable cars, etc.

a 2409 Herren Aeronautical Corp
220 James St.

Barring Ind

Small Plane for 'Poor' Man Burns Auto Fuel





"Economy" Plane, and, at Left, the Tiny but Powerful Engine That Flies It

Powered by a tiny motor no larger in diameter than a steering wheel, and burning ordinary automobile gasoline, a light airplane that its makers claim will do better than twenty miles to a gallon of fuel has been designed particularly for the man of average means. The ship is a two-place open biplane, nineteen and one-half feet long, with a wing spread of twenty-four feet. It weighs only 475 pounds empty, and about 950 pounds fully loaded. The secret of the plane lies in its engine, a four-cylinder, air-cooled two-cycle unit with a geared propeller and without valves in the ordinary sense. The pistons perform the work of the valves, letting the gas in and pushing the exhaust out. Also, each stroke of the pistons results in an explosion, contrary to the usual four-cycle method of explosions every two strokes, thus giving the engine eight-cylinder efficiency. The craft is expected to have a landing speed of thirty-five miles an hour, a top of 100 miles and a cruising radius of 340 miles at eighty-five miles an hour with a fuel load of sixteen gallons of ordinary automobile gasoline. The engine, twenty-three inches in diameter, is equipped with a supercharger and intended to develop fifty-eight horsepower.

SUBSTITUTE FOR COTTON FOUND IN THE YUCCA PLANT

a 2462

Germany has developed a substitute for cotton from the yucca plant, which is also common in America. By artificial culture and fertilization, and by crossbreeding, new plants are developed in about six weeks. The refinement of the fibers is simple and its worth as a cotton substitute is satisfactory, the price in Germany being about half that of cotton. The refining process has been patented.

dw. lives in Aberstedter. Saxonus, Prussia

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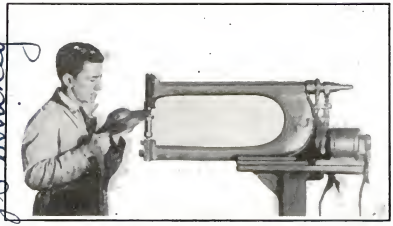
Andriot-Hairdson Co, Inc.
1307 Starks Bldg.
Louisville, Ky.
a2396

"VACUUM BOOSTER" FOR PUMPS ENDS DEEP-WELL ILLS

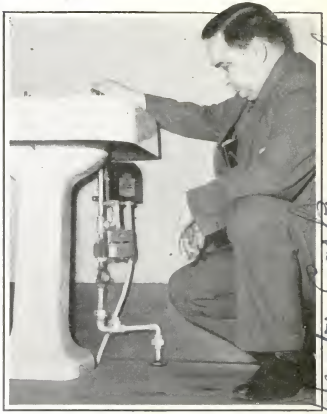
Suction pumping of deep wells is accomplished by a new system which has the additional advantage that all pump parts are on top of the ground. In the ordinary suction-force or centrifugal turbine pump, the action takes place below the water level and is therefore inaccessible in case of trouble. In the new pump, however, a chamber is placed in the well line, a few feet below the point where natural suction ceases. Water is sucked into the chamber, and there, by an arrangement of pressure valves connected with the pump at the top, atmospheric pressure is introduced on the head of water in the chamber, allowing a second intake pipe to pick up the flow. The installation also can be so arranged as to introduce greater than atmospheric pressure on the chamber and bring the water to the desired level under pressure and more speedily. The action of the pump, while in reality two-stage, is so perfectly controlled by the valve adjustments that the flow of water is continuous. The pump unit may even be placed at some distance from the well, as in a basement or attic, if desired.

LIGHT CURRENT RUNS HAMMER FOR METAL WORKERS

Light-socket voltage is all that is required to operate an electric power hammer designed for metal workers. The machine eliminates the necessity of high-power installations, heavy foundations and excessive space, usually required for a trip hammer. It is designed particularly for automobile and airplane workers.



Power Hammer That Operates from Light Socket Necessary in Many Varieties of Machine Shop



Automatic Heater That Delivers Cold or Hot Water from the Same Faucet

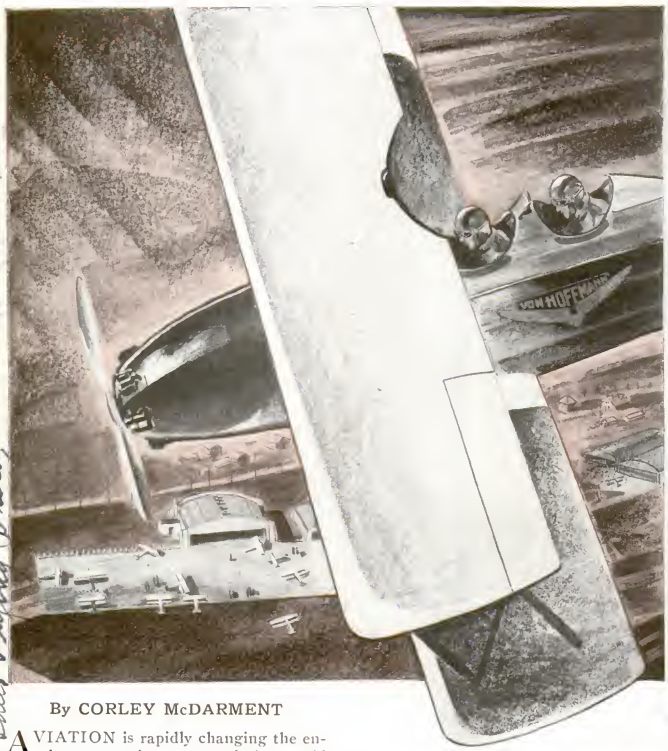
HOT OR COLD WATER DRAWN FROM SAME FAUCET

Hot or cold water can be obtained from the same faucet with the aid of apparatus installed in the water line near the sink. When the faucet is opened, an automatic switch turns on current in an electric heater placed in the water line, the fluid heating as it passes through. A pressure switch can be set to operate at any maximum temperature desired, and lower temperatures or cold water can be drawn.

"ONE-WAY STREET" FOR LIGHT FOUND IN TOURMALINE

Tourmaline crystals will permit the passage of light in only one direction, acting like one-way streets for city traffic. Light from all other directions or angles is absorbed by the crystals. This property of the mineral has resulted in manufacture of a scientific toy, tourmaline tongs, on which two crystals are so mounted that a point of darkness appears where all light is absorbed by the mineral acting on the incoming rays and then on light passed by the other crystal.

What AVIATION



By CORLEY McDARMENT

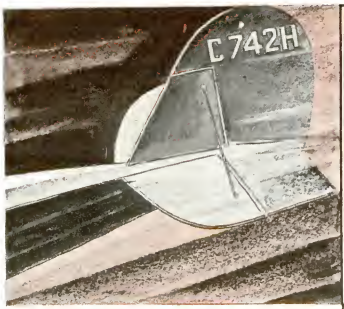
AVIATION is rapidly changing the entire economic system of the world just as the scheme of things was altered by highway development, Col. Halsey Dunwoody, vice president of American Airways, Inc., declares.

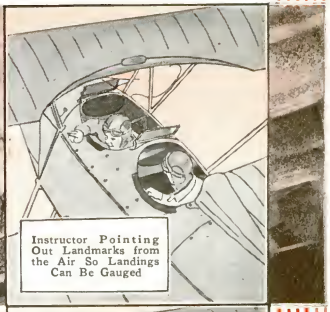
"Our country's progress has followed the evolution of transportation," he points out. "The most marvelous thing in the world is the human mind. Next in importance is communication, which enables one mind to share its product with another. Then comes transportation, which enables the movement of material things, and man with his powers of observation and expression."

Just a few years ago Orville Wright, father of aviation, stated that no airplane could fly eighty miles an hour, but today a speed of 415 miles an hour has been

q 2165

Offers YOU . . .





Instructor Pointing Out Landmarks from the Air So Landings Can Be Gauged

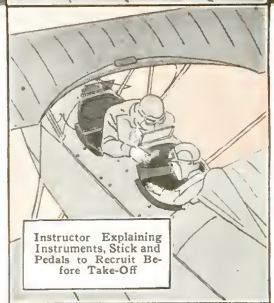
reached, and engineers consider 740 miles an hour a possibility within present-day knowledge.

On July 25, 1909, Louis Bleriot in a little twenty-five horsepower monoplane first flew the English channel—a flight of less than twenty-five miles that required thirty-seven minutes. Who at that time would have believed that in 1932 great air transports would be regularly carrying passengers, mail and express 163,689 plane miles daily over 51,455 miles of airways in America alone?

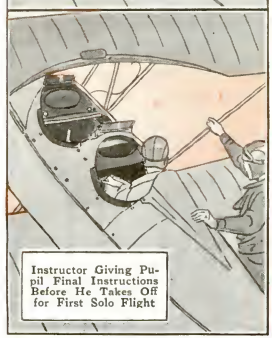
So the warning is clear—prepare for the age of marvels. Not in thirty or in fifty years—but next year, and the year following, and in five years. Who will accomplish flights so far-reaching and tremendous that by comparison the exploits of Lindbergh, Byrd, Doolittle, Gatty and our other present heroes will be looked upon as we now look upon Orville Wright's first twelve-second sputtering leap into the air?

Glorious things await the young man contemplating an aviation career today. The newer crop of pilots coming up will be smarter than the present one. They will have to know more. And the youths of today who learn the allied sciences connected with piloting airplanes will get ahead of those who become mere pilots.

The time is rapidly coming when nearly everybody who wants to fly a plane will

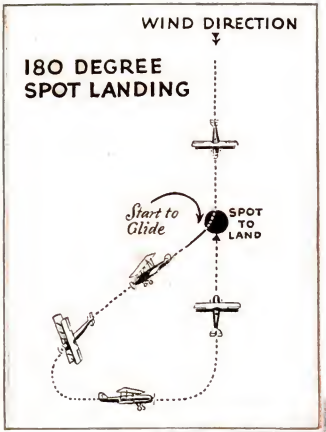


Instructor Explaining Instruments, Stick and Pedals to Recruit Before Take-Off



Instructor Giving Pupil Final Instructions Before He Takes Off for First Solo Flight

A2165



invented an airplane throttle control which may be operated with the same hand that a pilot flies with. The throttle is attached to the control stick. This boy's invention is being used by at least one commercial airline on service test.

If the present rate of airline extension is kept up, this country will be covered with a network of airlines by the time the present youth of ten years of age is old enough to get a pilot's license. The long trunk lines connecting distant cities or countries will require steady replacements as they grow. And the short feeder lines will need a vast number of pilots.

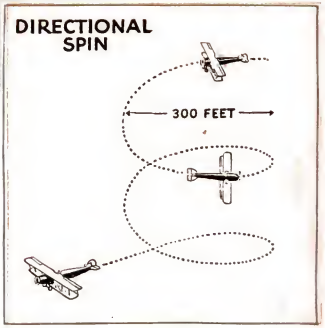
Of the two million workers connected with railroads, only a few are locomotive engineers. In aviation, however, there will always be a greater proportion of the men in the industry piloting aircraft. Most of the big men in aviation in the future will step up from pilot jobs to exec-



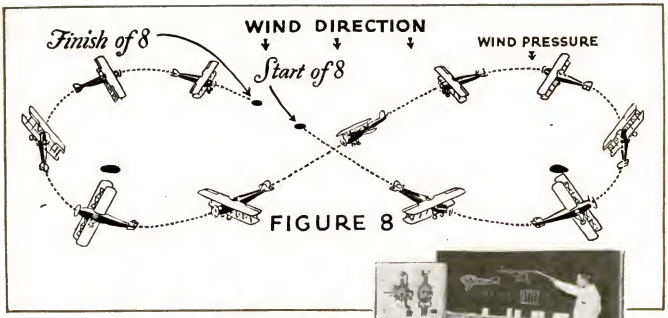
Section of Apron Serving Air Mail, Passenger, and School of Aviation Planes

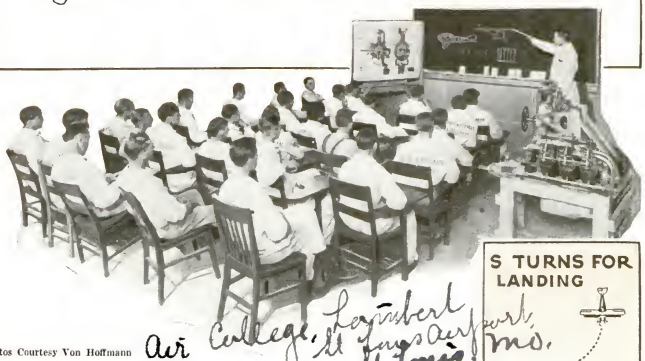
be able to do so. They are making planes so safe and fool-proof almost anybody can pilot them. Physical disability of certain kinds is no longer a bar to pilot's license. The department of commerce has lifted certain defective-vision restrictions on about 5,000 cases. It was realized that if pilots wore corrective lenses in their goggles they could see well enough to fly safely.

•A crippled boy who has just started in high school at Norfolk, Va., has recently



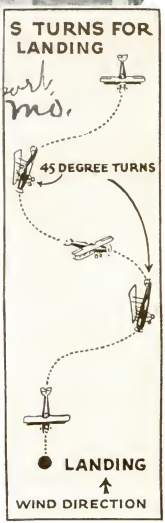
Q2165





Photos Courtesy Von Hoffmann

Class of Ground Students and Pilots at a Lecture on Engine Installation; Information Received Here Is Put in Practice in the Shop



utive positions as they have done today. It will always be an asset for a man in aviation work to be a pilot. But this is not absolutely necessary today and will not be necessary in the future.

Aviation is now a business. The more education the pilot of the future possesses, the farther he will go. But the time to start is now, and the future is entirely up to you. One of the best bits of advice that can be given a young man who wants to make aviation his career is to study foreign languages along with his other school work. The United States has already started airlines in Central America where Spanish is spoken, and in South America where both Spanish and Portuguese are used. There has been much demand for pilots, traffic managers, salesmen, airdrome managers and supply clerks who could speak Spanish. They were and are now needed in the Latin American countries. Men with these qualifications will be in greater demand as the big airlines in those countries branch out.

With the breaking of so many flight records within the past year or so, many get the idea that there is little left for anyone else to do. But

Q2165



Class Being Taught Wing Alining, at Top, and Adjustment of Master Rod Bearing of Radial Engine, Below

these records simply widen the gap between themselves and regular everyday flying, and somebody must do a lot of work to bridge this gap. And bridges are not built in a day or even a year. It may take ten years for the highest-speed passenger plane to attain the highest speed of the racing planes as they now stand. And by that time some other records will be set up which will make the gap as wide as it is today.

It is to the young men of today who are experimenting and earnestly studying aviation that flying must look for its future. The day of invention is not ended in aviation. Here is a wide open field for young men. Engines, fuels, instruments, methods of bracing, landing gears, wings, propellers, and nearly every other factor of flying will admit improvement through invention or refinement. Nobody yet knows why a bird can spread its wings and sail steadily against the wind.

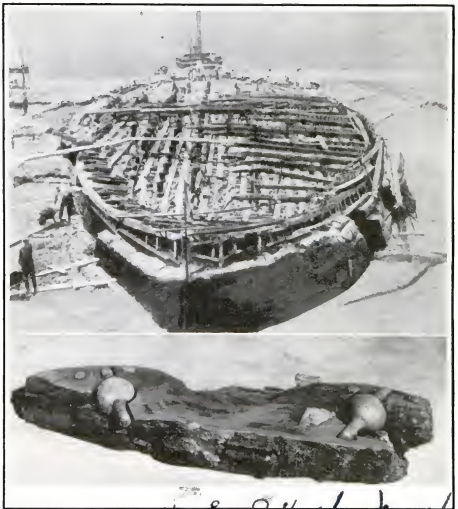
Every advance of civilization has been inseparably linked to transportation. Aviation provides the fastest way of getting from one place to another. Its development involves every other science from chemistry to meteorology and every form of business training—a future, therefore, of limitless possibilities.

¶A buffalo census has been taken by airplanes in Canada; the black moving masses against the snowy ground made excellent pictures for the cameramen.

a2447

Ball Bearings in Galley Show Roman Skill

Ball bearings, usually considered an essentially modern development, have been discovered on one of the barges of Caligula, which is now being restored after lying nineteen centuries at the bottom of Lake Nemi. Two of the galleys were sunk in the lake and the other now is just visible, in thirty feet of water. A piece of wood from what was evidently a rotating platform has two of the ball bearings in place. The wood is part of what was a disk, with holes in its underside, in which the balls rotated. The spheres were cast of bronze, and shafts, or trunnions, were integral with them. The trunnions were held in place by strips of bronze nailed over the sockets. This disk revolved about a pintle set in a facing disk, and the weight was thus transferred to the trunnions, the ancient Roman engineers not understanding the principle of the free-rolling ball as applied in modern practice.



© S. K. F. Industries, Inc.
One of Caligula's Barges Being Restored, Above, and a Section of Platform with Ball Trunnions in Place

It is believed the platforms supported images which were revolved by slaves for the entertainment of the emperor.

a2446

AUTO PLATES MADE LUMINOUS IN DARK BY VARNISH

License plates on your automobile can be made visible at night by applying a luminous varnish now on the market. The paint is applied like any other varnish and is not visible in daylight. At night, it will serve as a parking or tail light, if anything happens to the regular one.



Paint Makes Auto Plates Visible at Night

a2480

LOSS OF ELECTRICITY REDUCED BY LOW TEMPERATURES

Losses of electrical energy may be reduced if engineers find a way to apply the discovery that metal conductors reach the highest point of efficiency at temperatures hundreds of degrees below zero. The conductors must be made of an alloy which has been found a superlatively good conductor when subjected to intense cold.

a2413

When Fire and Blasts Destroyed Huge Liner



Unusual Night Photo of the 19,000-Ton Liner "Bermuda," Queen of the New York to Bermuda Service, Burning at Her Dock in the Second Destructive Fire in Five Months; Blazing Fiercely, with Explosions Shattering Her Hull, the Ship Turned Slowly and Became a Total Wreck Alongside the Yard in Ireland Where She Was Being Reconditioned after the Earlier Fire at Her Bermuda Dock; Below Is a Daylight View of the Heroic Battle to Subdue the Flames

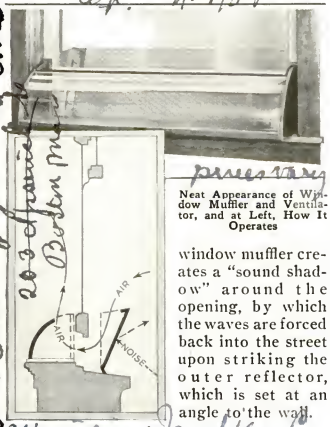
Wide World

DECAY OF TEETH NOW TRACED TO DEFICIENT SOILS

Tooth decay is caused, in a large measure, by foodstuffs grown on soil deficient in mineral salts, scientists agree. Exhibits at a recent meeting of dentists in New York showed that even a slight deficiency in vitamin C in the diet, while without apparent effect on the body, has a definite effect on the pulps of the teeth within twenty-four hours. Scientists say that there can be great variation in the value of milk, fresh fruits and vegetables to the general health and to the teeth. Oranges grown on the wrong soil, or picked too green, may be useless because they do not contain the needed mineral salts.

WINDOW MUFFLER BARS NOISE BUT AIDS VENTILATION

Standard mufflers for sliding sash windows that let air in the room, but keep out a great part of the traffic noise, now are available in three styles. Inner reflectors are of curved plate glass or metal, hooking, or being fastened by bayonet joints, into the sills. For wide windows, the reflectors are furnished in two sections. The outside reflector is flat plate glass or metal, finished to match the exterior trim. The



Neat Appearance of Window Muffler and Ventilator, and at Left, How It Operates

window muffler creates a "sound shadow" around the opening, by which the waves are forced back into the street upon striking the outer reflector, which is set at an angle to the wall.



The Life Raft Is Incased in Streamlined Metal and Mounted on the Top Wing

LIFE RAFT FOR PLANES AT SEA RIDES ON TOP WING

Seagoing pursuit planes may be equipped in the future with a new safety device, a streamlined metal container holding a collapsible life raft. An officer of the army air corps, stationed in Hawaii, has invented the apparatus, which is now being tested. The container is carried on top of the upper wing in the center of the plane, where it is immediately available in case of a fall into the sea.

ELECTRIC TIME-DELAY SWITCH WORKS LIKE HOURGLASS

Operating much like an hourglass, a time-delay switch has been placed on the market which, in its present form, allows delayed settings between two and twenty seconds. The principle of its operation is the movement of mercury from one receptacle to another. When the switch is thrown the mercury runs from one cavity into the other and, as the second chamber fills to the level of various wire contacts, the circuits are completed. The wires are tapped into the second chamber at certain timed points, and by changing the size of the metering orifice, an additional adjustment in the switch timing is obtained.

Showrooms on Wheels Bring Store to Buyer



Automobile Trailers Displaying Glassware, Upper View, and Radios and Refrigerators, at Right

Traveling showrooms now are being operated by two organizations, one to sell radios and refrigerators and the other glassware. Large trailers with fabric bodies are attached by swivel to a roadster or coupe. The employment of the trailer does away with the transporting of trunks, hiring sample rooms and arranging and dismantling displays, as well as the necessity of prevailing upon buyers to visit the display room.

ELECTRICITY HELPS FLY PLANE BY OPERATING INSTRUMENTS

Electricity is taking over much of the work of the pilot in flying an airplane. In a cabin monoplane recently built for the General Electric company, all the instruments except two, and a clock, are electrically operated, and the ship is to be equipped also with automatic steering, a device enabling the pilot to set the controls on a predetermined course and allow the ship to fly itself. For receiving weather reports and making contacts with radio range beacons and broadcasting stations, there is to be a system of synchronized radio apparatus. The asonic altimeter supplements radio and instrument indications, operating on the sound-echo principle to give an accurate indication of height above the ground in fog or darkness. By means of an electric engine-temperature indicator and selector switch, the pilot can determine the head temperature of any cylinder at any time. Other electrical devices include a magneto compass, card compass, drift indicator, turn indicator, tachometer, oil-temperature and pressure indicator, voltammeter, control pulleys, wing-edge landing lights, and an oil immersion heater.

HALO AND RAINBOW ARE SEEN IN BOTH DAY AND NIGHT

Confusion often is caused by the terms halo and rainbow, and many believe the difference is that the halo appears at night and the rainbow in the day. Actually, either may be seen both by day and night, if atmospheric conditions are right. The halo is due to the presence in the atmosphere of ice crystals, while the rainbow is caused by the refraction of light through water drops. The most common halo is a ring surrounding the sun or moon and may be highly colored in the daytime, while usually the lunar halo is so faint that the colors are almost imperceptible. A common form of halo is known as the "sun dog." The rainbow, on the other hand, instead of surrounding the illuminating body, lies in the opposite direction. As there are many types of halos, so also are there many forms of rainbows, even the fog bow, which is white or nearly so, being classed as one.

ACTUAL HEIGHT ABOVE GROUND SHOWN BY ALTIMETER

Actual height above the ground over which the plane is passing, instead of the distance above sea level, is shown by a new height gauge completed by a Vienna inventor. Pilots flying at night and through fogs have complained about the previous type of instrument, which gave no warning when obstructions, such as mountains, were in the offing. The instrument operates on the principle that the farther away a body is from the earth, the lighter it becomes. The differences are so slight, of course, that amplification is necessary, and this is accomplished mechanically. In tests, the new altimeter detected even the differences between forest and clearing, while any abrupt rocks or other upward or downward formations were shown without appreciable lag.

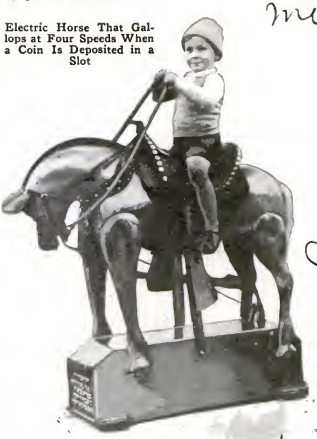
FLASHLIGHT AND KEY WALLET ARE COMBINED IN ONE

Combining flashlight and key container in one wallet, users are sure of finding the keyhole in the dark with the new "keylite." The holder comes in all colors and styles of leather, the leather being sewed around a tubular flashlight, at one side. Hooks are attached to the top of the leather, on which keys are hung. The flashlight is the same size as the penlights so much in vogue, and batteries are easily obtainable.



The Keyhole Is Easy to Find with Combination Light and Key Wallet

Electric Horse That Gallops at Four Speeds When a Coin Is Deposited in a Slot



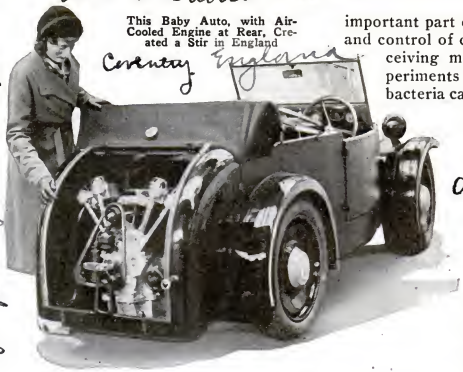
COIN-IN-SLOT ELECTRIC HORSES RUN AT FOUR SPEEDS

Sport for children is provided by an electric horse that runs when a coin is dropped in it, and develops four speeds to suit the fancy of the rider. There are four drivewheels in the base on which the horse stands, and these are engaged according to the pull exerted on the reins.

AIR LINE INTO LAKE SAVES FISH FROM DYING UNDER ICE

Fish are being saved from suffocation under the ice by oxygen forced into the water by an air compressor. A small portable engine pumps the air through an ordinary gas pipe and a nozzle frozen into the ice, but projecting into the water below. A depth of three feet of water beneath the lake ice is necessary for the equipment to operate successfully, since the pump is incapable of distributing the air properly. An area as large as 200 yards square can be treated to the point where the fish will not suffocate. In addition, air forced under the ice frequently opens up seams in the ice, permitting natural aeration. The plan has been used by the Iowa fish and game department.

Rover Co. Ltd Motor Works. Rover Road and Warwick Road Coventry England
a 2202
a 2338
Rover 'Scarab' at Motor Show at Olympia. price £89.
Third International Conference on Bituminous Coal
Science Service 11/18/31
Aerotrail Coaster
Eastern Office 1009 Marlyn Road. Phila.
Chicago Coal Products Mfg. Co.
Schiller Piano Co. Oregon, Ill



This Baby Auto, with Air-Cooled Engine at Rear, Created a Stir in England

SMALL AUTO HAS REAR MOTOR AND SEATS FOR FOUR

Powered by a motor in the rear, a small auto seating four persons has been placed on the market. The auto was the lowest-priced at the London motor show. The motor is built just behind the rear wheels and is closely coupled to the transmission system.

GERMS IN EARTH MAY CHANGE TEXTBOOKS ABOUT COAL

Microscopic germs working more than 3,000 feet deep in the earth, probably will revise those parts of the school boys' textbooks that tell how coal was formed. Dr. Franz Fischer, director of the Kaiser Wilhelm institute for coal research in Berlin, speaking at a recent conference in Pittsburgh, declared the old belief that coal was formed by the decay of ancient plants which first turned to peat, then brown coal, then bituminous and finally to anthracite was only partly correct. Doctor Fischer's research has led him to believe that if the right germs were present any type of coal would be formed directly without progressive changes. The important part of germs in the production and control of coal and its products is receiving much attention, recent experiments having shown that certain bacteria can take the poison elements out of illuminating gas and turn carbon monoxide and hydrogen into methane.

SLED WITH WINGS LIKE PLANE

Shaped like an airplane, a coaster with wings offers many thrills for boys, for it is easily converted into a scooter by adding wheels when the snow and ice disappear. The sled has only one main runner on which a frame resembling the contour of an airplane body is mounted. At the front is a movable wing with auxiliary runners at each side. The main runner is two and one-half inches deeper than the side runners, the latter being used principally for steering and making turns. When used as a scooter, wheels are attached to the side runners and to the tail. The balancing feature of the main runner gives the rider more speed and thrills, but the coaster is under control at all times, since it is virtually impossible to turn it over because of the side runners. Short ski jumps can also be made with the sled, the rider standing upright and controlling the coaster by means of a rope attached to the wing tips.



Sled with Wings That Can Be Used for Skiing or Made into Scooter by Attaching Wheels to Tail and Wing Runners

a1921 Cmdr. John F. Coggswell, 16
Edgemoor Road,
Belmont, Mass

Secrets of ICE BERGS' BIRTH



Trying to Blow Up an Iceberg with a Huge Charge of T.N.T.; Observers Said the Result Was About the Same as Shooting a Rifle Bullet into the Side of a Big Bowlder

BESET by terrific gales, threading a precarious passage between scores of floating ice mountains and groping her way through dense fogs, the 125-foot coast-guard patrol boat, "General Green," last summer made her way through Davis strait and into Baffin bay, to the very birthplace of the icebergs, returning with new information and reliable data of utmost importance in the latest plan for reducing the iceberg menace in the steamship lanes.

It is with the hope of bettering the splendid service of the iceberg patrol that the birthplace of the bergs has been invaded. Eventually it is hoped there will be sufficient data to enable prediction well in advance of the number of bergs to be expected, the places where they will invade the steamer lanes and the course they will take. To arrive at this end, the iceberg experts are going right back to the source of the ice mountains to learn what conditions foster a great "calving" of bergs by glaciers and what conditions determine the route taken by them in their long journey south, where they become a menace to shipping.

The world holds few more awe-inspiring spectacles than the movement of icebergs out of Jacobshavn fjord, into Disko bay, on the west coast of Greenland. Jacobshavn glacier is the world's greatest mother of icebergs, the experts claim. The coast guardsmen have found twenty-two major glaciers contributing to the majestic procession that sweeps down on the steamship lanes. The contribution of Jacobshavn glacier leads all the rest. On the average, it calves more than 1,350 bergs each year. The Jacobshavn fjord is a giant trough in the solid rock, four miles wide and running back inland fifteen miles, between high precipitous walls, to the front of the glacier. When the investigators ran the prow of their little craft into the mouth of the fjord, they were met by an impassable wall of bergs.

The hunters made their way afoot to the top of the rocky bank. As far as eye could see in the fjord, icebergs were packed tightly, row on row, a breath-taking aggregation of white pinnacles and domes. They estimated that the great rock-walled trough held between 4,000 and 6,000 bergs. Those bergs, they decid-

a1921





Top, a Great Glacier Moving Down into Baffin Bay; Below, Coast-Guard Cutter at Berg-Blocked Entrance to a Bay in the Arctic

ed would average about 7,000,000 tons of ice each, or upward of 30,000,000,000 tons of ice in that one fjord.

The movement of the bergs is not a steady march. Most of the year, they lie there, packing in tighter and tighter. About once a month they move. There comes a cracking and roaring, at first low and then swelling to a volume that nearly fractures eardrums. Suddenly the ghostly procession takes on momentum. At first the onward surge is barely perceptible, but the pace increases minute by minute, until the bergs are careening along at five to eight miles an hour.

When they will start and what starts them are as yet unfathomed mysteries. The experts are inclined to believe that an accumulation of water, caused by the melting of the surface of the glacier, gathers in sufficient weight to sweep the bergs forward. Another theory is that the bergs become solidly jammed against the face of the glacier, whose forward movement is passed on to them.

This is one of the problems that the coast guardsmen wish to solve. If they can ascertain just the conditions that cause the discharge of bergs into Disko bay, it will be an important point in pre-

dicting the number that will reach the steamer lanes at any particular time.

The investigators have learned that the birth of an iceberg occurs in a manner far different from the popular conception. It was long believed that the bergs simply broke away from the front of the glacier by sheer weight. It is true that a few small bergs are formed in this manner, but not the big fellows. Coming down its steep bed, the front of the glacier runs deeper and deeper into the water of the fjord. As the bulk beneath the surface increases in relation to the weight above, its natural buoyancy creates a great upward push. Finally, this push becomes greater than the strength of the ice mass. Then the glacier front fractures at the bottom and breaks away from the main body.

There has long been a belief that stresses within the large bergs are such that a slight shock will knock them to bits. Experiences of the patrolmen have proved this theory a fallacy. They have peppered all sorts and sizes of bergs with explosive shells and discharged great masses of T.N.T. against them, but have not succeeded in shortening the life of any berg by a single week.

The slow-burning explosive, thermite, seems to have some possibilities. A charge of 100 pounds was placed to a depth of three feet in the top of a flat berg and ignited. Parts of the ice disintegrated, and, when the berg was revisited some hours later, about 400 feet of it had disappeared.

LIFE-SIZE MOVIES FOR HOME WITH NOVEL PROJECTOR

Life-size moving pictures of theater quality now can be enjoyed in the home with the aid of a new amateur projector.

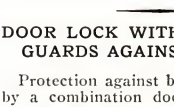


Life-Size Movies Are Available for the Home with a Projector Embodying Many Features of the Commercial Theater Machine

The brilliance is obtained by an improved 375-watt lamp, a new lens, condenser, larger reflector and different reflector adjustment. A light trap also is provided to prevent stray illumination. The projector is entirely gear-driven. The rewind is automatic, and a pilot light has been built in that turns off when the projector lamp is switched on, and vice versa. Controls are provided for reversing or stopping.

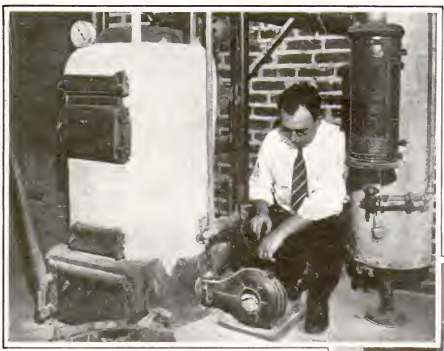
DOOR LOCK WITH BELL ALARM GUARDS AGAINST BURGLARS

Protection against burglars is provided by a combination door lock and alarm now on the market. A chain connects the bell alarm with the locking device, and the slightest pressure on the door starts the bell ringing. The chain may be lengthened to allow the door to be opened a few inches so that one may see and talk to a visitor without admitting him.



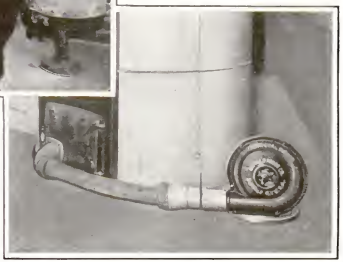
Buffalo Forge Co
465 Broadway.
Buffalo, N.Y.
a 2240

Better Heat from Cheaper Coal with Blower



Electric Blower for the Furnace Which Creates Forced Draft and Enables Use of Cheaper Coal

Score another worthy triumph for American heating and ventilating engineers whose research has developed inexpensive electric blowers which are efficient in providing a forced draft in your heating plant and which will reduce your annual coal bill from one-third to one-half or more where properly used. This new heating-plant accessory is particularly valuable in that it facilitates the use of the cheaper grades of anthracite coal, such as buckwheat, rice and barley, which sell for from one-half to three-fifths of the price of the best grade. These electric blowers are adaptable for use on all types of hot-air and pipeless furnaces as well as on hot-water or steam-heating plants. They are easy to install, simple to operate and require no more electric current than an ordinary reading lamp. The cost of operating the blower is less than 50 cents per ton of coal burned. A thermostatic control shuts off the blower automatically, the heavy bed of ashes prevents natural draft, and the fire, so to say, takes a nap for the time being until room temperature again falls below the desired degree when the blower goes into action and spurs the fire to increased vigor. While elaborate and expensive types of electric blowers are on the market, the motor and fan of an old forge may be used for the purpose. It is a simple matter to install one of these blowers as an important adjunct to the furnace or heating plant when first erected. The customary procedure is to cut an opening into the ash pit and to hook up the forced-draft mechanism to that aperture by use of a galvanized metal duct and a short piece of rubber tube. If the blower equipment is added after the furnace is completed, it is sometimes necessary to remove the furnace casing—particularly in the case of hot-air furnaces—before an opening can be cut into the ash pit. The best results in burning buckwheat, rice or barley-size anthracite coal where an electric blower is used are obtained by keeping the live fire highest at the coal door and the green unburned coal slightly lower and at the rear of the fire box where the blower is attached to the ash-pit door. The electric blower can be operated successfully either under hand or automatic control. Under the manual method of operation, the blower is turned on and off in the same way as the average home fireman adjusts the draft damper by means of the usual chains. The draft damper at the ash door is kept shut and retired from service. The only damper which remains to be adjusted is the one in the smoke flue. It should be



opened when the blower is not in use, as a safeguard against overheating, just after the blower is shut off. A number of different installations are possible under automatic control where the electric blower is attached to a thermostat. Frequently, the thermostat is yoked to operate both the check draft in the smokestack and the air-blast check gate at the discharge end of the blower. Do not close the damper in the smoke pipe if you use an electric blower. It should be half open at least to let out the carbon-monoxide gas.

GOATS REDUCE COST OF MILK AND MAKE A PROFIT

Goats as a source of milk supply for the suburbanite or resident of the smaller city will reduce cost as well as furnish a food considered so easily digestible that it often is fed delicate infants. Even where all the fodder is purchased, the cost for a 135-pound milch doe is only about five cents a day, and two of the animals will produce from four to eight quarts of milk every twenty-four hours. Where the goats are maintained under absolute sanitary conditions and fresh, wholesome feed is given them, the milk has neither objectionable odor nor flavor. Any milk produced over and above the immediate needs usually finds a ready and profitable market in the feeding of neighborhood babies. An elevated table, which includes a seat for the milker, recently has been developed and makes the milking a simple task.



Elevated Table That Makes the Milking of Goats a Simple and Sanitary Matter

SUN GLASSES COVER THE NOSE AND PREVENT BURNS



Nose Guard for Sun Glasses Keeps Tender Skin from Becoming Sunburned or Freckled

Tender noses may now be protected from sunburn by the same glasses that prevent eye strain on the links, polo field or beach during the fashionable winter season. The odd-appearing pair of colored spectacles has a nosepiece that matches the rim and covers the nose.

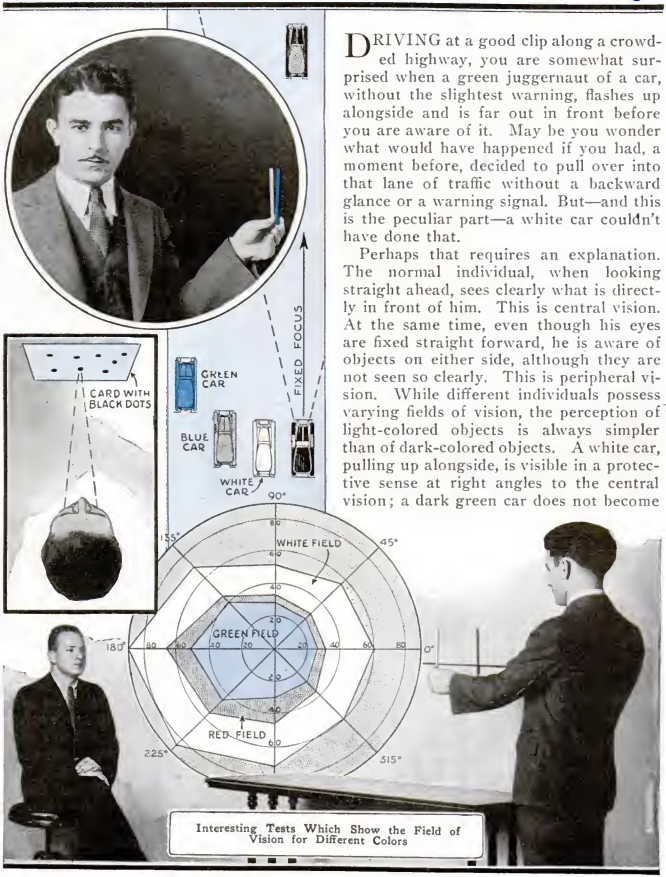
FOOD IS CHANGED TO POWER IN DUST MOTORS

Explosions of coal dust, often the cause of great disasters, give promise of becoming one of the chief power sources of the world, according to Rudolph Pawlikowski of Germany. Ignitionless, Diesel-type internal-combustion engines have been run thousands of hours and produce a kilowatt-hour for about twenty-six per cent less than the steam turbine. Italian sanzza, a meal made of the residue left from the manufacture of olive oil, and ground up wood has operated the motor just as well as coal dust. Cheap vegetable powders for which there is little use, such as those from palm kernels, sunflower seed, rape, hemp, peanuts and soya beans, are recommended as good motor fuels. The dust motor is essentially a Diesel engine with the addition of an auxiliary chamber in which the fuel is prepared for admission to the cylinder head where it is compressed and exploded.

a2101 - Cmk. Sam Brown,
151 Carhart St
Marion, Ohio

Here's Something to Think About:

How Much Do You Really See?

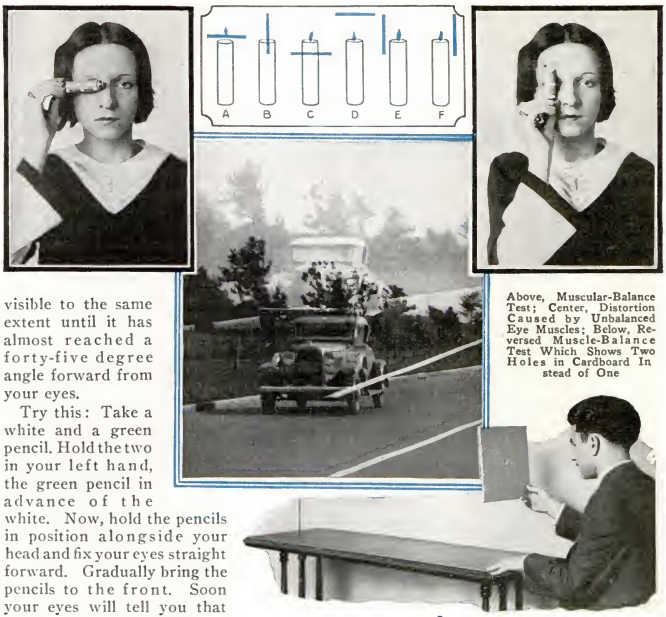


Interesting Tests Which Show the Field of Vision for Different Colors

DRIVING at a good clip along a crowded highway, you are somewhat surprised when a green juggernaut of a car, without the slightest warning, flashes up alongside and is far out in front before you are aware of it. May be you wonder what would have happened if you had, a moment before, decided to pull over into that lane of traffic without a backward glance or a warning signal. But—and this is the peculiar part—a white car couldn't have done that.

Perhaps that requires an explanation. The normal individual, when looking straight ahead, sees clearly what is directly in front of him. This is central vision. At the same time, even though his eyes are fixed straight forward, he is aware of objects on either side, although they are not seen so clearly. This is peripheral vision. While different individuals possess varying fields of vision, the perception of light-colored objects is always simpler than of dark-colored objects. A white car, pulling up alongside, is visible in a protective sense at right angles to the central vision; a dark green car does not become

a2401



Above, Muscular-Balance Test; Center, Distortion Caused by Unbalanced Eye Muscles; Below, Reversed Muscle-Balance Test Which Shows Two Holes in Cardboard Instead of One

visible to the same extent until it has almost reached a forty-five degree angle forward from your eyes.

Try this: Take a white and a green pencil. Hold the two in your left hand, the green pencil in advance of the white. Now, hold the pencils in position alongside your head and fix your eyes straight forward. Gradually bring the pencils to the front. Soon your eyes will tell you that your hand holds a white pencil, but the green one, even though it is in advance of the white, does not become visible to the same extent until the hand is carried farther forward.

In a similar manner, each color has its own field. As shown in the diagram at the bottom of page 248, the green field is very restricted, the red somewhat larger and the white largest of all. Driving the black car shown in the sketch, a white car, a blue car and a green car have to occupy the respective positions shown in order to be visible to the same extent. Of course, under actual driving conditions you vary a straight-ahead gaze with occasional glances to either side. This is as it should be. It is a common mistake with near-sighted persons to maintain a fixed focus, keeping the eyes constantly on a distant point. Far from making the vision better, this often tends to produce temporary blindness over certain areas of the retina on either side of the fixing point. Black dots on a piece of cardboard will disappear and reappear in puzzling disorder if the eyes are concentrated for even a short time on any one dot. Looking at one dot and then another in quick succession allows you to see all of the dots with greater clearness. Fixing your eyes intently on a pencil held in the hands of another person, you cannot tell with any degree of certainty when another pencil, a few inches distant from the first, is brought to a position even with the first one. But by focusing your eyes on one pencil and then on the other, you can easily judge the distance and tell the person to move the pencil this way or that until you see that they are equidistant from your eyes.

Muscular balance of the eyes plays an important part in the distance-judging

test just described. Without perfect balance, the whole test "goes haywire." There are six little muscles that control the movements of each eye. They are so delicately balanced that they cause the eyes to act in unison to see but one object. When the eyes are not properly balanced, either you see double or else make a constant effort to maintain single vision. The necessary effort to attain single vision causes eye fatigue, headaches and the dancing black spots of partial blindness.

You can easily judge whether you have perfect ocular muscular balance by a very simple test. Take a small round bottle and paste a gummed label around it after first cutting out a portion of the label to form a narrow slot on opposite sides of the bottle. Fill the bottle with red liquid of any kind and cork it tightly. Now, with both eyes open and the slot in the label opposite the right eye, as shown in the top photographs on page 249, fix your gaze on a candle flame or electric bulb at a distance of twenty feet. With the bottle held horizontally, you will see a vertical streak of red light. This streak should pass directly through the candle flame, as at B, if your eye muscles are perfectly balanced. Holding the bottle vertically, the streak should pass directly through the flame, as at A. If the streak is above or below in one position, or, to either side in the other position, your muscular balance is imperfect. In almost every case, a slight abnormality is revealed. When the deviation is so great that the eyes cannot overcome it, double vision, as indicated in the central photograph, results. Working the muscular-balance test in another manner, you will see double if your eyes are normal. Looking through a hole punched in a piece of black cardboard at a pencil or other object some distance beyond, you will see two holes in the card instead of one.



Courtesy Westinghouse Electric and Mfg. Co.

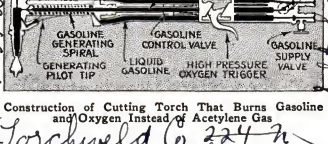
Demonstrating Wireless Light Capable of Illuminating Bulbs Forty Feet Away or Quickly Cooking a Meal

WIRELESS LIGHTS UP A BULB FORTY FEET AWAY

Light from an ordinary electric bulb, without any wires connecting it to generator or power line, recently was demonstrated in the power-tube laboratory of the Westinghouse Electric and Manufacturing company. All that is necessary is for the bulb to be placed in the ultra-high-frequency field produced by a standing wave oscillator sending out 15,000 watts from an antenna. The power comes in the form of radio waves, three meters long and alternating 100 million times a second. The tremendous power lights all lamp bulbs within forty feet, cooks food in a few seconds and raises body temperature one degree per minute, also causing exhilaration in the human subject if too long exposed.

GASOLINE CUTTING TORCH IS SAFER AND CHEAPER

Gasoline fuel is employed in a cutting torch just placed on the market that is said by its makers to reduce costs, promote safety for operators and save space in the shop. The torch is fitted with a self-generator that turns the gasoline into vapor, after which it is mixed with oxygen and ignited as in the usual type of oxyacetylene tool. Tests show that on



Construction of Cutting Torch That Burns Gasoline and Oxygen Instead of Acetylene Gas

badly rusted plate the gasoline-burning torch saves up to fifty-two cents per hour of operation.

BIRD REFUGES ON WASTE LAND PLANNED BY U. S. BUREAU

Bird sanctuaries will be built on waste land in every state, under plans of the U. S. bureau of biological survey of the department of agriculture. Thousands of acres of non-productive land will be used in this manner, while 1,796,000 acres already have been surveyed in the government's move to conserve wild life. Bird refuges and bag limits are the only means of preventing extinction of ducks, geese and other migratory birds. Six sanctuaries have been established, while nine more states have passed legislation allowing the government to establish preserves. Forty states now have such laws, with Arkansas, Idaho, New Hampshire, Pennsylvania, Tennessee, Utah, Vermont and Washington yet to join the movement.

"BEEHIVE" PLACED IN FURNACE CUTS COST OF FUEL



Made of a refractory material that is guaranteed to stand 3,200 degrees of temperature without burning, a "beehive" fuel saver has been developed for the coal-burning furnace. Manufacturers of the device argue that the ordinary coal fire is only about fifty per cent effective because sufficient oxygen never gets through the fuel bed to cause thorough combustion of the gases above the fuel level. The beehive saver is built in the shape of an inverted cone with vents in the sides through which the air can flow. Air is drawn upward into the cone, preheated there, and enters the combustion chamber at a temperature making quick ignition possible. This places enough oxygen above the fuel to ignite the smoky gases, which ordinarily would pass out unburned.



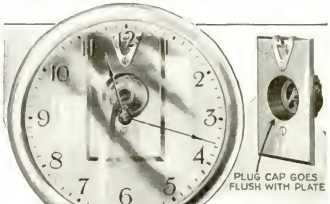
With This Truck One Man Can Handle the Largest Outboard Motor Alone

HAND TRUCK FOR BOAT MOTORS MAKES HANDLING EASY

Outboard motors are handled easily by using a hand truck now on the market. A wedge-shaped board, to which the motor can be securely attached, is fastened on the handles of the truck, thus enabling one person to move the largest outboard without any difficulty.

CLOCK HANGER ON WALL PLUG KEEPS WIRES HIDDEN

Combining with it a mechanical support for the electric clock, an electrical wall-outlet plate has just been developed that assures neat appearance. The plug cap is fitted with a metal hanger and is recessed so as to fit flush, allowing the clock to hang flat over the outlet with the connection and receptacle fully concealed.



Wall Hanger and Plug for Electric Clock That Keeps All Connecting Wires Out of Sight

a-2216

How to Avoid the Tricks of the Pickpockets



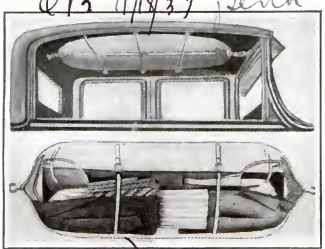
Upper-Left Photo Illustrates How a Pickpocket and His Confederate Operate; Right, Dummy on Which Pickpocket Practices; Lower Left, the Obliging Victim Is Being Robbed; Right, Lifting a Ring

Whenever you are in a crowd where pushing and jostling is likely to pass unnoticed, you become a potential prey for the pickpocket, and you can best thwart this type of thief by recognizing his methods and being on the lookout for them. To ply his trade successfully, the pickpocket must not only have agile fingers, but he must maneuver you into a position where you are likely to be unsuspicious of his actions. Pickpockets often work alone, but usually they operate in pairs. On a jammed street car or elevated train, for instance, one of them may spread a newspaper in such a way as to hide his hands as he lifts your watch from a vest pocket. Once he has the timepiece, he passes it immediately to a confederate standing at his elbow, so that even if you were to miss the watch and suspect him because of his proximity, you would not find it on him. It is also well to beware of the stranger who asks for a match and then allows you to hold it for him while he bends for a light. While your interest is centered on holding the match to his cigaret, the pickpocket's interest may be concentrated on a watch or purse in your

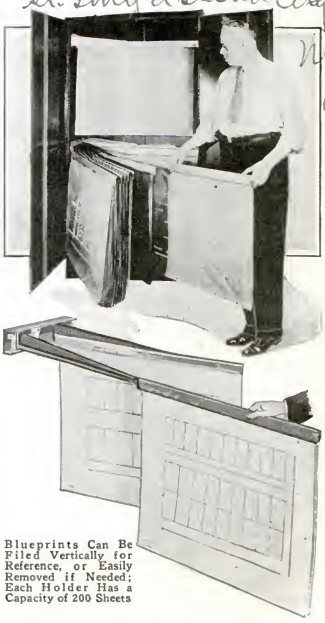
coat or vest. Undue jostling in a crowd is likewise to be viewed with suspicion. One pickpocket may distract your attention with a push while his companion extracts your purse as you glare at his confederate. Some pickpockets undergo a strenuous period of practice with a dummy on which they try their skill after fitting it with a system of bells which ring if they make a false move. A variation of the pickpocket's game is to enter a jewelry shop and ask to see watches and rings. After inducing the salesman to bring out several items, the thief pretends interest in one piece, attracting the salesman's attention to this while withdrawing a more valuable item from the display.

CLOTHES CONTAINER FOR AUTO ATTACHES TO ROOF OF CAR

Clothing can be kept fresh and unwrinkled while on an auto trip by placing it in a bag that holds more than a large suitcase and is attached to the roof of the car where it is out of the way and takes up little needed space. The bag has hangers at each end and can be removed from the car or left packed for any period of time without damage to its contents. For easy handling, it can be folded to half its size. All openings are fitted with hookless fasteners, and any article can be removed without disturbing others. The container attaches to eyes placed at front and rear inside the body, and is held firmly in place by a turnbuckle adjustment, three rods passing under it to give support. Only a few minutes are needed to install the fixtures.



Large Clothing Bag That Keeps Suits in Press and Is Attached to the Roof of the Car

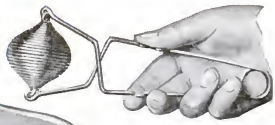


Blueprints Can Be Filed Vertically for Reference, or Easily Removed if Needed; Each Holder Has a Capacity of 200 Sheets

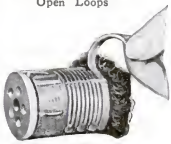
BLUEPRINTS FILED VERTICALLY ON SWINGING HOLDERS

Vertical filing of large sheets, such as blueprints, tracings and maps, now is possible with the introduction of holders which swing out when the blueprint is desired. The units are interchangeable so that it is possible to start the file with a single holder, with capacity of 200 sheets, and to build up to indefinite limits merely by adding more units. The holders are made for all sizes of sheets and can be placed on walls, tables, in cabinets or closets. Sheets are attached to a holder by punching or gumming to punched strips. Sliding keepers lock the paper-fastener prongs, enabling speedy removal or addition of sheets. The holders slide on a track formed by hanger arms which are swiveled to allow swinging out for inspection or removal of prints.

EASIER WAYS



Coil-Spring Flour Sifter; When Handle Is Pressed, the Spring Is Extended, Letting Flour Enter through Open Loops



Mineral-Wool Scouring Pack in Rubber Handle, Which Peels Away to Expose Fresh Surface as the Material Is Used



Gas Range Equipped with Three Handy Cabinet Drawers for Pots, Pans, Knives, Forks, Spoons, and Other Necessary Cooking Utensils



Electric Ventilator for Kitchen Window to Remove Cooking Odors; It Is an Air Pump with Twin Units, and the Panel Mounting Is Adjustable

Below, Door Holder to Stop Intruders; It Is Operated by Pressure of Foot





Safety Seat for Washing Windows; the Frame Is Adjustable to Fit Wide or Narrow Windows, and Is Held in Place by Arms Which Extend below Sill and at Sides of Frame

of DOING IT



Left, a Candle That Can Be Burned at Both Ends; It Is U-Shaped and Rests in a Neat Bakelite Holder





Left, a Double-Duty Utensil, Consisting of Funnel with a Hinged Strainer

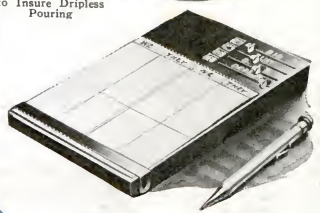
Above, Serving Tray Shaped Like a Palette with Recesses for Glass, Ash Tray and Sandwich; It Is Easily Held in One Hand, Hence No Table Is Required for Serving; It Is of Plywood and Comes in Colors



Right, Spoutless Teapot of Heat-Resisting Glass with a Lid and Handle of Chromium; There Is an Opening in the Lid and a Special Curve to the Lip to Insure Dripless Pouring



These Are Not Toys, but Tiny Garden Tools for Cultivating Potted Plants in the Home



Bridge Scorer and Pad with Adjustable Slides to Record the Bid, the Suit, the Doubles and Redoubles, and the Dealer



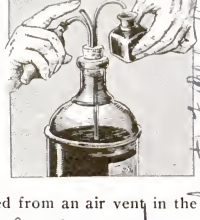
Placing Valve Tips in a Hardening Machine Which Is Controlled by an Electric Eye

ELECTRIC EYE HELPS HARDEN STEEL FOR VALVES

By recognizing various color changes in steel during heat treatment, a photo-electric cell has been made to regulate the tip hardening of valves. A valve is placed in the hardening machine and electric current is passed through the tip. When the tip is at the proper heat, the cell shuts off the current and drops the valve into a quenching bath.

DRIP FROM SCHOOL INK BOTTLE IS STOPPED BY SIPHON

Waste of school ink is eliminated by a glass container with a dripless siphon now on the market. The siphon provides a steady flow of ink from the container to the individual bottle as long as the bulb is squeezed, but stops the flow instantly when the operator's finger is removed from an air vent in the siphon.



HOW TO FIND THE STRENGTH OF A ROPE

Every one uses rope, which in its broadest sense includes all kinds of string, twine and cable. So, the industrious housewife, as she balls up the odd bits of various sorts of string becomes a co-worker with the boatswain of the mighty battleship as he lays out his great hawsers, more than 900 feet in length. Both are working with the one thing that has made it possible for man to triumph over and become master of the animal world, for without that little spark of genius which first recognized the power that lay within the crude bits of forest string—small vines—the world might yet be in the dark ages of countless centuries ago. Rope is made of the vegetable fiber of plants and ranges in size from the finest thread to the large manila hawsers, fifteen inches in circumference, strong enough to lift a weight of more than sixty tons before it breaks. However, very little rope of this size is used, since a wire rope, two inches in diameter, has a breaking strength of over 140 tons. Manila rope leads in all qualities except strength; hemp, or white rope as it is sometimes called, being somewhat the stronger. Manila is smoother, more pliant and offers greater resistance to decay due to the fact that it absorbs very little water in comparison with hemp. To find the strength of a piece of rope, open up the end and count the threads which you will find to be six, nine, twelve, fifteen, and so on. For each thread the rope will lift 100 pounds, but if you want it to last a reasonable time, from fifteen to twenty pounds to the thread is correct. For larger size rope, its circumference squared and multiplied by 150 gives its working load in pounds. There are other ways of arriving at the same thing by a more complicated calculation, but the above method is sufficiently accurate. Rope deteriorates rapidly if stowed away wet or in a damp place, or if exposed continuously to heat.—John Donald Thompson, Chief Boatswain, U. S. Navy.

Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information will be furnished free upon application to our Bureau of Information.

a2128 Used by Post Office in London

Fake Radio Truck Bluffs Unlicensed Fans

In England, where the owners of radio sets are required to pay for licenses to receive broadcasts, so many attempts were made to evade this regulation that the British authorities recently launched a campaign against unlicensed listeners. A truck, fitted with a formidable array of instruments and a shiny swivel aerial on the roof, was hauled through the streets, making frequent stops while a crew of men twirled the dials and twisted the aerial. Frightened by the activities of these radio sleuths, 80,000 persons who had been using receivers without licenses hurried to obtain them. At the close of the campaign, the London Express told that the truck was a fake and could detect nothing. The hoax was intended only to scare set owners to buy their licenses.



Views of Radio Truck Containing Fake Apparatus Which Frightened British Listeners into Buying Licenses, and One of the Investigators

Science Service 11/9/31.

a2361.

COAL USEFUL AS A FERTILIZER TO STIMULATE PLANTS

Coal in small doses may find wide use as a fertilizer because it exerts a stimulating action on plants, causing them to increase their yield by more than one-fourth. This is the conclusion of Dr. Franz Fischer, German authority on coal and its uses, who increased the yield of tobacco plants by using dissolved brown coal as a fertilizer. Scientists cannot account for this stimulating action as they have discounted the possibility that the coal might be a source of carbon and the suggestion that mineral substances in the coal might act as fertilizers. While pulverized brown coal may speed up plant growth, subsoil strata of brown coal retard growth, it was found.

Science Service 11/9/31

Kaiser Wilhelm Institute Berlin, Germany.



Base for Cradle-Type Telephone; It May Be Mounted on Wall or Set on Table

COMPACT CRADLE-PHONE BASE FOR WALL OR TABLE

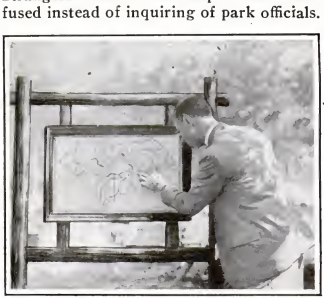
Cradle telephones may be placed on walls where they are out of the way by the use of a holder containing recesses for the mouth and earpieces. The switch is so arranged that the weight of the phone will open the circuit whether it is in a vertical or horizontal position, so the holder is suitable for table use too.

AIR "BOMBS" MAY HATCH CHICKS IN TWENTY-FOUR HOURS

Poultry farmers of the future may be able to hatch chickens in twenty-four hours instead of twenty-one days by using an air "bomb," or compressor cylinder, instead of an incubator. This is the prediction of gas experts of the Imperial College of Science, London, who took a leaf out of the book of daily experiences of deep-sea divers to aid them in hatching eggs. Divers in deep water work under a high air pressure, equivalent to that of the water above them, compressors forcing air down to them from the surface. In the process of working under water, the diver's blood becomes impregnated with bubbles of nitrogen gas, so he ascends gradually to get rid of the nitrogen, or else decompression takes place in a chamber above, at safely graduated periods. The divers' experiences suggested to a biologist that eggs might be hatched more quickly if submitted to similar conditions. Experimenters first tested frog spawn by placing it in a steel cylinder at a pressure about fifty-two times as high as normal atmospheric pressure. This was maintained for twenty-four hours at a temperature normally required for hatching the eggs. When the tadpoles hatched, they were placed in water to "decompress" them, and, while injured by this rough and ready method, they managed to live three days. Next a dozen hen's eggs were placed in a steel compressor at a temperature of forty degrees, and the air pressure was raised to one ton per square inch. It was expected that the egg shells would collapse, but strangely enough, they did not, the shells apparently having been porous enough to allow a percolation of air through them to equalize pressures. This method was found to speed up hatching, but, as in the case with the diver, a method of "deflating" the chicks was necessary. This was accomplished in a special type of decompression chamber.

MAP STANDS FOR LARGE PARKS AID VISITING TOURISTS

Large parks in strange cities often cause tourists difficulty because they are unable to find their way about, but Rock Creek park in Washington, D. C., has solved this problem by installing big outdoor maps directing visitors to the points of interest. These map are placed in frames under glass and rest on rustic stands. Strangers consult the maps when confused instead of inquiring of park officials.



Outdoor Maps Like This Direct Visitors to Points of Interest in Large Parks

a 1912 Sam Brown, 151 Carhart St Marion, Ohio

MAGIC *for* EVERYBODY



IN the whole field of conjuring, there is no more popular division than impromptu magic. And small wonder. Not only do these tricks require no previous preparation or special apparatus, but the actual workings of the effects are usually quite simple—an important consideration to that vast army of would-be entertainers with little time for practice.

Try this: Take an ordinary kitchen match and cut off the business end, leaving about one-eighth inch of wood. Remove the drawer from a penny box of matches. Put the cover on a table. Put the match head on the cover. Now, holding the drawer, open side down, in your right hand, you can very easily brush the match head off the cover and onto the table, imprisoning the head under the box. In performing the stunt, you go through this movement twice, but the third time you lift the drawer to show the match head—and the thing isn't there. Vanished completely. All because, in sliding the match head off the box, you allowed a tiny bit of the wood to project beyond the drawer. The result is that the match does a fancy somersault backward through the cover, ending up in the palm of your hand or in your lap.

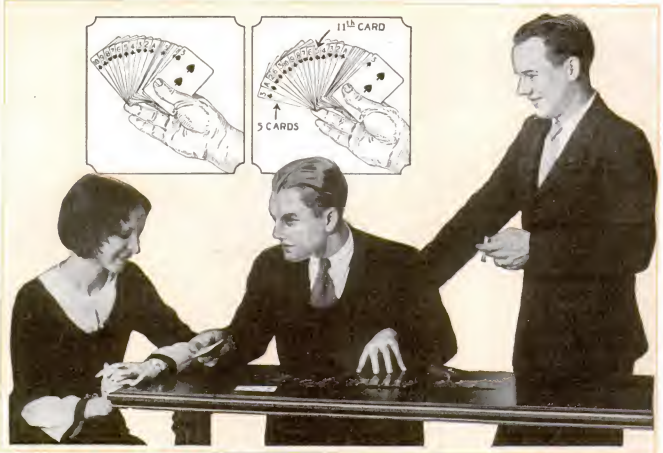


Above, Using a Matchbox to Make a Match Head Vanish; Below, Tearing a Double Thickness of Cellophane

a1912

If you are a cigaret or cigar smoker, you have probably noticed long before this that the new cellophane wrapping is an exceedingly tough fabric. Double a piece and try to tear it. Hand it to the strong man of your crowd and acquaint him with the general idea. May be he'll tear it; may be he won't. At any rate, he should register great surprise when you gently tear the tissue with effortless ease. And how do you do it? Simple! You prepare for the demonstration by punching a few holes in the cellophane with a pin. On removing the wrapping from the pack, you tear the cellophane (quite simple with a single thickness) and hand the unprepared half to a spectator with the request that he double it and try to tear it in half. While he is busy doing this, you casually crease your half of the paper so that the fold comes directly on one of the pinholes. And there you are! Tearing at the pinhole, the thing fairly melts away.

Here's one with cards: The performer fans the deck and requests a spectator to take a small bunch of cards, not over ten, from the center of the deck. The spectator is to count these cards, note the card on the bottom and then place his packet on top of the rest of the deck, which is held by the performer. The latter does not know how many cards were taken, nor the bottom card of the packet, yet, after counting out a number of cards on the table, he instantly turns over a card which shows the number of cards taken and then turns over another card which proves to be the one selected. But it's so very simple. Starting out, you have a series of cards from ace to tenspot arranged on top of the deck. Now, regardless of how many cards the spectator takes, the eleventh card will always show (by the number of pips) how many cards were taken. Thus, in the illustration on this page, the spectator has added five cards to the top of the pack; and the eleventh card shows a fivespot. If he had added six, the eleventh card would be the six-spot, and so on. Does that clear it up? You simply count out about eighteen cards on the table. Turning over the eleventh card, you immediately call out the number of cards taken, and then, knowing the number taken, you can easily count from the beginning of the row and turn up the selected card.



By Having a Series of Cards from One to Ten on Top of the Deck, the Performer Can Easily Tell the Number of Cards Removed by a Spectator and Name the Bottom Card

9 1912







Drawings in This Column and in Center Show How a Loop of String Is Made to Slip off Spectator's Finger by a Few Moves





At Top of Page Is a Trick with Three Water Glasses That Looks Easy When the Spectator Sees It, but Is Not So Simple When Tried



Removing Loop of String within Another Loop: Below, Why You Can't Make a Six Like the One on Your Watch





a1912



An Easy Coin Trick; the Dime Drops from under a Handkerchief into the Trouser Cuff

For some real fun, try turning the tumblers. Like this: The performer arranges three tumblers on the table, placing two upside down and the third upright. The big thing is to make exactly three moves, turning over two tumblers at each move, and on completion of the round have all the tumblers mouth up. The performer does it easily, but the spectator fails every time. Why? Consider the illustration on page 261. Notice that the top row of glasses are arranged with the end tumblers mouth down and the center tumbler mouth up. From this position, you can turn all of the tumblers mouth up in exactly three moves by turning No. 1 and 2, then No. 1 and 3, and then No. 1 and 2 again.

There you are. Turning over the center tumbler and leaving the end ones upright, you invite a spectator to try it, but even if he were to repeat your moves exactly, the thing would be impossible. By watching your chances and stepping in whenever the tumblers are in the correct position, you can keep the fun going for some time.

Here's a loop that won't stay put. You loop it over a spectator's finger; you make a little twist or two, and, presto! it's off again. (See the left-hand pictures on page 261.) Notice that the string has been looped over the spectator's finger, and that the performer makes his first move by inserting his forefinger between the two strings, pulling the far string over the near one. Next, the hand is turned over to allow the thumb to enter the loop next to the spectator's finger. The rest really doesn't matter. If you will make these two moves and then place your forefinger on top of the spectator's forefinger, you will find that the mere action of disengaging the thumb will cause the loop to come free, as in the center photo.

A good stunt to follow the loop trick is shown in two of the right-hand pictures. You start by tying a small loop in a piece of string; then tie the ends of the string together with several good knots to prevent the small loop from getting away. But it does get away. After the spectators have given the thing up, the performer covers the string with a handkerchief, and, by simply pushing the single knot up to join the others, causes the small loop to vanish. And they call it magic!

Here's something worse: Tell your friend he is very unobserving. Tell him he has a watch which he has looked at a thousand times, yet you wager he does not know the style of the numerals. "Are they Arabic, script, Roman or what—I ask you. Here take this pencil. Try to draw a number, say the number '6,' like it is printed on your watch." Ho, hum! At any rate, you can readily appreciate that this is a very difficult stunt, for the average watch has no numeral "6," this space being taken up by the second-hand dial. But don't get the idea you knew that all the time. You didn't.

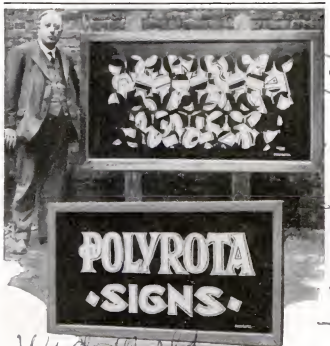
This is a good way to get rich. First of all, you borrow a dime. Then, you very nonchalantly ask the lender if he would pay a dime to see a really good trick. Yes? All right. Then you proceed to make the dime vanish. You place it on your knee. You cover it with a handkerchief. You draw the hanky tight to show that the dime is there. You grip the dime through the handkerchief and lift it up. You gently waft the hanky to and fro. You tell the spectator thanks for the dime. Of course, no decent spectator will ever suspect that you gently flipped the coin forward after covering it with the hanky, letting it slide down your trouser leg and into the cuff.

MOLD-KILLING SPRAY TO SAVE MILLIONS IN LUMBER

Sap stain or "blue stain" and mold, causing estimated annual losses of about $10,000,000 through depreciation of air-dried lumber in storage, may now be prevented by a chemical-spray treatment for pine and certain hardwoods. The preventive has been tested in more than a hundred mills and has proved successful in maintaining the bright, natural appearance of pine, sap gum, black gum, yellow poplar, magnolia, and other woods. It may be applied by dipping, if preferable. The cost of treating average lumber is found to be about twelve cents per thousand board feet.

THIS SIGN BREAKS UP LETTERS AND REASSEMBLES THEM

Advertising signs in which the letters and words fly to pieces, and then reassemble to form the original message are being used in Europe, where the motion involved has been found to attract much attention. Such signs consist of boards with revolving disks, the letters or pictures being painted on the boards and disks while they are in one particular position. When the disks are made to revolve, the letters appear to fly to bits, but reassemble again when the disks return to their original positions.



The Letters on This Sign Fly to Pieces and Reassemble; the Figures Are on Revolving Disks



Electric Hot-Dog Cooker That Turns Out Hot Buns in About Two Minutes

ELECTRICITY COOKS "HOT DOGS" AND HEATS THE BUNS

Wiener sandwiches are heated ready to eat in less than two minutes by an electric cooker now being offered which prepares five "red-hots" at a time. The cooker consists of a metal tray with prongs on which the buns and meat are impaled, the wiener completing the circuit.

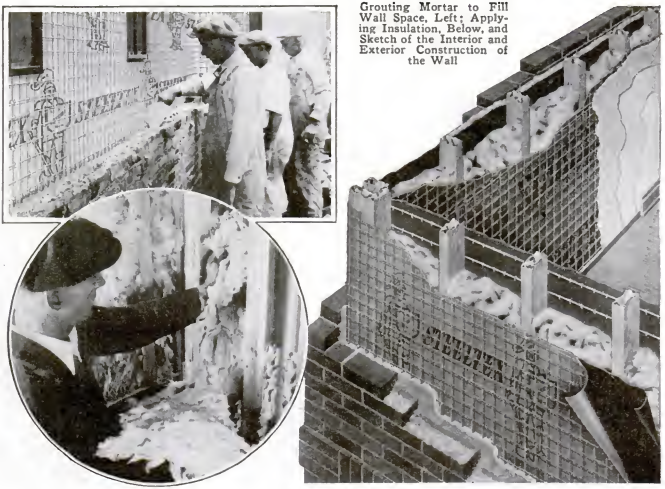
FEATHERS GET HUES FROM SUN BY REFLECTING LIGHT

To a considerable extent, the rainbow hues of the pheasant's feathers are rainbow colors in fact, for they are due largely to reflection of light from transparent substances in the feathers, just as the rainbow is due to reflected light from transparent raindrops. Dr. Stanley C. Ball, of the Peabody museum, Yale University, found the iridescence of such feathers is determined partly by the shape and position of the barbs, partly by the position of the light source, and partly by the position of the observer. This does not mean that feathers have no colors of their own. There are plenty of pigment bodies in parts of the feathers, but the real "show" of a bird's plumage is mostly a matter of reflected light.

a 22 7 6 National Steel Fabric Co
Union Trust Bldg
Pittsburgh, Pa

Steel Backing for Brick Makes Better House

Reinforced Lafer Wall Construction



Grouting Mortar to Fill Wall Space, Left; Applying Insulation, Below, and Sketch of the Interior and Exterior Construction of the Wall

Steel reinforcing for brick-veneer construction that not only provides waterproofing, insulation, vermin and fire resistance, soundproofing and economy, but also employs only standard building methods and materials, now is available for the home builder. Ordinary brick-veneer construction leaves a space between the brick and the sheathing, which it is now believed, causes a draft, actually conducting heat or cold. In the new system, the wall is studding framework as usual, but on the outside of it a welded two-by-two-inch wire-mesh reinforcement with a heavy paper backing is nailed, replacing sheathing boards. The bricks are laid one inch away from the reinforcement, and the space is grouted with regular mortar as the brick are laid. The outside wall, when completed, then becomes a monolithic reinforced slab of brick and masonry. The reinforced wall is the same thickness as the ordinary one while the structural strength is greater and heat-resisting characteristics are considerably better. After the outside walls are finished, a mineral-wool insulation may be placed from the inside by pressing it between the wood studding. Interior walls and ceilings then are lathed with two-inch wire-mesh paper-backed lath, a base and reinforcement for interior plaster. This interior construction not only eliminates all lath, joint and stud marks, retards sound, prevents infiltration of moisture and air and greatly reduces the tendency to crack, but adds strength. The entire home thus is wrapped in efficient insulation and incased in a network of steel wire, which takes up strains and stresses in every direction.

MOSQUITOES TRAVEL BY PLANE AND MENACE HEALTH

A 232

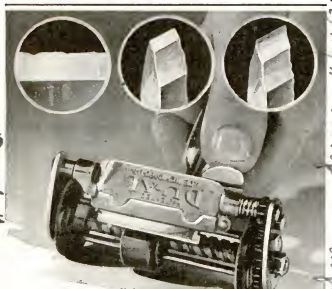
Mosquitoes hitch-hiking rides on airplanes from South America can bring the virus of yellow fever into this country, but the danger is small if the planes are treated to destroy their free passengers. This conclusion has been reached by the public health service which has made a study of mosquito transportation by plane.

Science Service.
11/11/31

Investigators put stained mosquitoes onto planes leaving San Juan, Porto Rico, and received a certain number when the ships arrived at Miami, 1,250 miles distant, the same day. From these tests it was estimated that about one-fifth of the mosquitoes boarding an airplane might be expected to stay with the ship on a trip of 1,000 miles or more, despite the repeated landings, opening of doors, hatches and windows, and the refueling, loading and unloading that might take place. Under normal conditions about airports, heavy infestation of planes would be unlikely, but even one infected mosquito might be the means of starting an epidemic of fever, it was pointed out. It is not difficult, however, to treat airplanes so as to destroy any mosquitoes aboard.

SHARPENER HONES AND STROPS SAFETY-RAZOR BLADES

Safety-razor blades are honed and stropped in a single operation with a sharpener which produces a hollow-ground cutting surface like that on straight-edge razors. The sharpener in general appearance resembles a tiny lawnmower, with a wheel at each side and an abbreviated handle. As it is moved forward, the combination stropper and honer, a fine round honing stone, moves from side to side against the blade, reversing its direction as it reaches each end. All regular-size blades, both single and double-edged, are accommodated in one model.



Safety-Razor-Blade Sharpener Which Produces a Hollow-Ground Cutting Surface on Any Blade

RUBBER BULBS USED AS "CUES" IN PUFF-BILLIARD GAME



Miniature Billiard Game Played with Rubber Bulbs Which Blow Cork Balls about the Table

Rubber bulbs are used as cues and a small cork ball replaces the ivory ones in a miniature form of billiards. Puff-billiards is played on a circular table containing four pockets. There are four players and each manipulates one of the rubber bulbs attempting to keep the light cork ball from entering the pocket he is protecting. Score markers are mounted on the rim of the table.

LIVER CONSERVES BODY'S HEAT BY TAKING UP WATER

At the onset of a fever or when the body is chilled, the liver saves heat by storing up water. This new function of the organ was discovered recently by Dr. Henry G. Barbour, of Yale University. The onset of fever, he explained, resembles the reaction of the body to cold, the shivering or chill producing extra heat which is saved by withdrawal of most of the surface circulation. When fever is produced, the blood becomes more concentrated and loses part of its water content, but at the same time the water content of the liver increases. Since the principal way in which the body loses heat and becomes cool is by evaporation of water, Doctor Barbour reasoned that the liver takes up the water lost by the blood at the start of fever, thus saving heat for the body by preventing its dissipation through water loss and evaporation.

a 1940 Cmt. James R. Miller
2024 F St. N.W.
Washington D.C.

With the





Above, Sketch of a Junk That Was Grounded in Search for Pirate Queen; Below, Taking Powder from a Magazine

FIGHTING the bloodthirsty Chinese river pirates who recognize no man-made law and regard human life as a joke is one of the major jobs of Uncle Sam's Yangtze patrol. Six American gunboats travel daily back and forth along the 1,000 tortuous miles of the Yangtze between Nanking, capital of China, and Chunking, deep in the interior.

Sailors, policemen, detectives, protectors of the life and property of all nations—such are the Yankee bluejackets who work where romance beckons, death threatens always and action is demanded. Almost unbelievable in their cruelty and acceptance of medieval pirate methods are some of the recent acts of the river bandits, according to official records of our navy and state departments.

Plundering merchant ships of all nations of untold millions annually, forcing many of their victims to walk the plank, and holding others to ransom up to $500,000 for a single individual, these ruthless pirates possess remark-

a 1940

Chinese Pirates



Above, Sketch of Typical Chinese Pirates Boarding a Vessel to Loot and Kill; Below, Reefing Sail on the Yangtze River

able cunning; so much so that in the past they have been almost impossible to identify, let alone catch or bring to justice. When some unfortunate vessel strikes a rock, whenever floods spread a virtual reign of terror for hundreds of miles, or treacherous currents or gorges make a boat well-nigh helpless, the river pirates plunge from their hidden retreats along the shore to pillage, despoil and murder.

Assuming that the victim vessel is fairly close to shore, the bandits will assemble some twenty or thirty men, armed with old pistols, rifles, cast-off cannon or even stolen machine guns. Whereupon their victims, helpless to offer resistance, must give in or die. Small wonder that the great powers, including the United States, Great Britain, France, Italy, China and Japan, maintain regular gunboat patrols along the river. During the past year the merchant ships have suffered an almost unprecedented number of bandit attacks. As might well be expected, China and Japan lead the other nations in numerical strength of armed vessels along the Yangtze, with the United States and Great Britain competing for second place. However, no nation has

Q 1940

more modern or more efficient equipment than our six regular gunboats and two "spares." When unusual emergencies arise, such as a devastating flood, or special pirate threat, these crack boats are augmented by destroyers from our Asiatic fleet.

Few Americans know that our Yangtze patrol was established as far back as 1870. Today it is a regular subdivision of the Asiatic fleet. Its base is at Shanghai, with sub-base at Hankow. The gunboats are under command of Rear Admiral Yancey S. Williams. During normal times, the patrol protects American missionaries and traders who have established their posts along the river, and escorts American ships traveling its course, or places armed men aboard them for protection from raids by bandits. Nor does the patrol limit itself to safeguarding American citizens and their property. Under special order of the United States government, our gunboats go unhesitatingly to the aid of others who may be threatened with outlaw attacks, for the patrol can go into remote stretches of the mighty river into which no other units of our fleet can penetrate.

Again and again the vessels of the American fleet have aided the Chinese government in the maintenance of aids to navigation along the river. Bandits constantly are removing buoys and lights marking the channel, causing hundreds of commercial ships to ground upon dangerous shoals, where they are pirated easily.

All the patrol ships are flat-bottomed and have lately been equipped with bullet-proof steel. It has been found expedient to build the gunboats in three sizes, to fit them for duty on the three chief zones of the Yangtze. From Shanghai to Hankow, the river is open to navigation by ocean steamers for nine months of the year. From Hankow to Ichang, the river can be navigated only by smaller vessels. At Ichang, the treacherous gorges begin. Only especially constructed vessels can proceed up and down these rapids.

The two largest gunboats, the "Luzon"



American Bluejackets of the Yangtze River Patrol in China; These Yankee Sailors Constantly Patrol the River and Its Harbors to Protect Merchant Vessels from Pirates

9 1 9 40



Above, Yankee Gunboat near Foochow; Below, Gunboat Convoying American Vessels on Yangtze River

and the "Mindanao," are about 198 feet long, of 500 tons' displacement, and have a speed of sixteen knots. They have been fitted for flagship accommodations. The two patrol ships of intermediate size, the "Oahu" and "Panay," are some 180 feet long, of 385 tons' displacement, with a speed of fifteen knots. The smallest two, the "Guam" and "Tutuila," vessels assigned to protect American interests in the gorges of the upper river, are about 150 feet long, of 350 tons' displacement, and a speed of fourteen and one-half knots. Each patrol ship carries forty to sixty men, three officials and one or two three-inch guns with some machine guns.

In traversing the gorges and rapids of the Yangtze, speed and immediate control are vital factors in safe navigation. The situation demands power combined with light draft in all ships. During the flood season, from May to November, the stream throughout its length tests the skill of the best seamen. This explains why all the patrol ships are steered by Chinese navigators. A rise of forty-eight feet overnight in the river during the flood season is not uncommon, and in a twinkling, millions of people are left homeless.

When the current becomes unusually dangerous, Yangtze "trackers," numbering from fifty to 200, haul the vessels through the rapids. These Chinese live in villages along the gorges and their occupation has been passed down for centuries from father to son. It is a sight to watch these scores of well-built men, naked except for a loincloth, harnessed to bamboo towing ropes, bent double on the narrow trail hewn out of solid rock, laboriously

a 1940



© Wide World



Above, Typical Wreck Which Offers Pirates Chance for Pillage; Below, American Sentry in China

pulling a heavy junk up the river. Who are these ferocious river pirates? Where do they recruit their numbers, which run well into the thousands, and do they ply their outlaw trade through necessity or sheer deviltry? At some time or other they may have belonged to a more or less organized unofficial army. Perhaps the rebels disagree, scatter and go hungry. Whereupon, needing food and property quickly, they resort to banditry.

Once thus engaged, almost nothing stops them, for they know long stretches of territory so thoroughly that, when hard pressed by armed troops, they easily can lose themselves in some remote portion of China's vastness, there momentarily to simulate a life of peace and non-resistance until the representatives of law and order have left the vicinity. Aside from their common habit of hiding along the banks of the Yangtze to prey upon merchant vessels, many and varied are the ruses employed by the bandits to board commercial ships and steamers in search of plunder, money and ransom.

Often, for instance, they will steal a vessel—frequently an innocent-looking junk—and deliberately force another ship upon the rocks, where, partially wrecked, the victim vessel, passengers and crew will be at their mercy. Another common system of piracy is for a group of bandits, well armed, to disguise themselves as passengers and board a steamer. When once safely aboard, some prearranged signal is given and all of a sudden the robbers, stationed at several strategic points on the

A 2252. Schick Dry Shaver. Inc. Stamford, Conn

ship, flourish their weapons, and, if they deem it expedient, shoot to kill.

A striking example of this took place some months ago on the British steamer "Haiching" when it was riding a remote stretch of the Yangtze. The exact number of casualties is not known since some passengers jumped overboard, others escaped in one of the vessel's lifeboats, and still others perished by drowning. However eight bodies were found, the known wounded numbering twenty-three. Fortunately the attack finally was frustrated by the determined resistance of the captain, ship's officers and crew. The pirates, who were between twenty and thirty all told, succeeded in setting fire to the ship and it was due only to the timely arrival of three armed British vessels that the "Haiching" was saved from destruction.

Women pirates are by no means rare. Recently a woman led a piracy on the steamer "Deli" while it was traveling from Hongkong to Swatow. Many passengers were wounded and three taken for heavy ransom. Then a party of bluejackets came to the rescue and escorted the ship back to Hongkong.

A 2107 Lever

BUFFALO TURNS WATER PUMP TO IRRIGATE RICE FIELD

Rice fields along the banks of the Nile, in Egypt, are irrigated by wooden water wheels turned by buffaloes. The animals are driven in a circle around a horizontally placed wheel with teeth which engage the spokes of the water wheel, raising water to the level of the irrigation ditches.



Turned by Buffaloes, This Water Wheel Is Used for Irrigating Rice Fields along the Banks of the Nile

Wilkens

DRY SHAVE IS NOW POSSIBLE WITH ELECTRIC RAZOR

$25.00 Razor



© Halbran

How Dry Shaving Is Accomplished, Top, and Below, Interior Details of Electric Razor

Requiring neither blades, lather or cleaning, an electric razor has been developed by a pioneer in the field. It operates either on alternating or direct current and has but one moving part. The motor that drives it develops one-ninetieth of a horsepower and actuates a shearing plate that cuts the whiskers much like a hair clipper. The whole assembly weighs but eight ounces, and the manufacturer claims it is impossible to cut yourself with it. It operates by slight pressure against the face and sliding up and down. The motor has several unusual features. The rotor is laminated, and has neither windings nor commutator. Make-and-break contacts of tungsten take the place of the commutator bars.

Mrs. Carl Jacob Schick

¶Chicago, with 604, has more hotels than any other city, but New York leads in number of guest rooms, with 126,632.



Central Arch of New Westinghouse Bridge, Which Will Shorten Autoists' Time Between Pittsburgh and the East

LONGEST CONCRETE ARCH SPAN NAMED "WESTINGHOUSE"

Two hundred and sixteen feet above the stream, the new George Westinghouse bridge soon will replace the old Indian trail to the west, spanning the wide Turtle Creek valley near Pittsburgh. It is the critical link in the new Lincoln highway cut-off, shortening time and distance between Pittsburgh and the east. The improvement, almost five and a half miles long, eliminates a hill with a nine-per-cent grade, dangerous curves and long the cause of much traffic congestion. The bridge consists of five reinforced-concrete arches, of which the central one is 460 feet long and said to be the largest concrete-arch span yet built in the United States. When finished, the total cost of the bridge will be about $4,500,000.

PETROLEUM COKE IS EFFICIENT FUEL

Coke made from petroleum has been found to offer an efficient fuel for both industrial and domestic use. In the refining of crude oil, a jelly-like residue remains after the more volatile constituents, such as gasoline, kerosene and lubricating oils, have been driven off. This residue is made into coke, and for every barrel of oil treated, chemists can recover from eighteen to 143 pounds of this fuel, which looks like coal and is composed of ninety-five parts of carbon and five of hydrogen. It burns almost completely, leaving virtually no ash, and is regarded as the purest form of industrial carbon available in large quantities. It is used in the manufacture of carbon electrodes, carbon brushes, abrasives, ferro-alloys, steel, paints, illuminating gas, brick and lead pencils, for heating orchards imperiled by frost and for smoking hams to give the meat a hickory flavor. The annual production in the United States is about 1,500,000 tons.

PLANE THAT FLIES "BACKWARD" HAS ELEVATOR IN FRONT

Giving every appearance of flying backward when in the air, a midget airplane of unconventional design is virtually without a tail and has its elevator on a projection in front. The latter feature is said to guard against stalls, and a small wheel, far forward, protects against nose-overs. The cabin is back under the wings, and the craft, which weighs only 450 pounds, is driven by a thirty-horsepower motor.



Small Plane Virtually without a Tail and with Its Elevator in Front; in the Air It Appears to Be Flying Backward

a2189

Artist in Wood Carves His Figures from Life

Characters encountered by the artist in his travels have been carved in wood by Emil Janel and exhibited in a San Francisco museum. Janel started his work at the age of four, later coming to America from Sweden and working in lumber camps. Subjects such as a gardener, an accordion player, the depression apple salesman and an intoxicated man clinging to a lamp-post have been executed by the artist.



The Artist with Some of the Figures He Has Carved in Wood Mostly from Models Picked Out during His Travels

Wide World

a2414

GOLD TRAPPED BY CARPET NAP IN LATEST SLUICE BOX

Carpet or burlap nap traps ninety-eight per cent of the gold passing through the latest sluice box designed for placer mining on the sand bars of Colorado streams. Fortunes in the shining flecks, known as "flour" gold, are expected to be taken from the sand by the apparatus. Screens so fine that water will scarcely pass through them, are features of the sluice box. A riffle board of unusual design whirls the gold flecks and black sand in the second step of separation, sending them into a trough. A lining of carpet or burlap is used in the trough, the particles of gold being held by the nap.

SHINGLES FOR INSIDE FINISHING GIVE NOVEL EFFECT

a2295

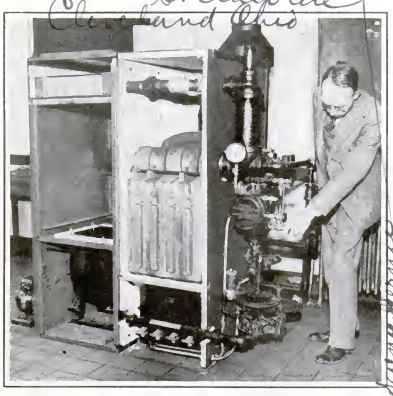
Shingles often can be used to excellent effect in interior finishing. Particularly is this true in the case of the log home or the rustic cabin. One such vacation house was constructed in California, in which the living room has one wall of stone, incasing a gigantic wood-burning fireplace, and the other three walls are finished in long shingles, nailed from top to bottom with the thick end up, instead of from bottom to top with the thick end down, as is done in the case of a roof.



Courtesy Celotex Co.

Shingle Interior Finish Gives the Walls of This Hunting Lodge a Novel Appearance

11/28/31 My Herald Outdoors
d w. H.C. Mitchell
919 N. Michigan
Chicago
natural Montrose Colo



Air-Conditioning Unit for the Home Which Supplies Warm Air in the Winter and Cool during the Summer

WARM OR COOL AIR FOR HOME DELIVERED BY SAME UNIT

Warm or cool air, as required, is delivered by a compact air-conditioning unit for the home recently developed. This device, about the size of an ordinary furnace for a small home, is adaptable to straight air conditioning or a combination of air conditioning and radiator heating, so that it is, in fact, equally available for heating the house in winter and cooling it in the summer.

EXPLOSIVE FROM NATURAL GAS IS SAFE AND CHEAP

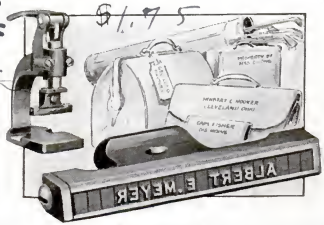
Butane, a simple compound of carbon and hydrogen, has been combined with sodium chlorate to produce a new powerful explosive which eliminates much danger from blasting operations. By compressing wet natural gas over oil, the butane is produced at low cost, while the sodium chlorate also is cheap. A Los Angeles chemist prepares the explosive by soaking in butane a simple cartridge of crystalline sodium chlorate. The standard electrical apparatus is used in detonating the charge, but if an hour or more elapses before the cap is fired, it is harmless because the butane has boiled away. This increases safety of blasting, since the danger from an unexploded charge literally evaporates within a short time. Hazards of transporting the explosive are eliminated, because butane and chlorate are stored in separate containers. Neither chemical alone will explode.

CLOUDY DAYS LIGHTER IF SUN IS PARTLY HIDDEN

Daylight may be brighter when the sun is partly hidden than when the sky is clear. This is indicated by experiments with an automatic photographic recorder at Manitoba agricultural college. When the sky is covered with light clouds and the sun itself is out of view, the recorded illumination was found greater than in full sunlight in a cloudless sky. Thus, though a cloud in front of the sun might reduce light intensity by thirty-five per cent, this would be more than balanced on favorable occasions by the reflecting effect of a cloud bank. Of course, when the unobscured sun was also reinforced by reflecting clouds, the brightness was at a maximum. The apparatus consists of a photo-electric cell connected to a galvanometer.

EMBOSSER PRINTS YOUR NAME IN GOLD LETTERS

Personal property may be protected against theft by stamping the owner's name in gold or colored enamel with a pocket-size embosser now on the market. Name and address are deeply imprinted and cannot be removed.



Personal Property May Be Embossed in Gold Letters with This Handy Vest-Pocket Outfit

a 2059

Rochester N.Y.

Photos Taken *in the* Dark

FIFTY famous men, sitting in a pitch-black room, heard a voice say, "Sit still, gentlemen; you are now being photographed."

Zz-z-zii-ippp—one second! The camera had spoken. Lights went on. In about one hour, they were shown a photographic likeness of themselves, each face plain and recognizable.

Dr. C. E. Kenneth Mees, director of the Eastman laboratories, had been asked to entertain members of the National Research council with something which had never been seen before. How was it done?

Infra-red light, invisible to the eye, but not to the newly developed, highly sensitized film in the camera, was used to accomplish the feat. Sensitizers, discovered and applied during the past year, have sped up the possible infra-red sensitivity of photographic emulsions to the point where the picture could be made almost instantaneously, Doctor Mees explained.





Above, Picture Taken by Visible Rays; Below, One Taken with Invisible Infra-Red Rays

The spectrum, it is explained, is divided into two sections, visible and invisible light. Visible light is the color of objects around us, all the colors of the earth and sky. But beyond the visible band of light, at opposite ends, are two invisible light regions embodying the infra-red and ultraviolet. Infra-red is the color following directly upon the color red as we know it. And ultraviolet is the color extending beyond the color we call violet.

The only limit to the range of infra-red rays for long-distance photography is the curvature of the earth itself and the altitude which men can reach, said Doctor Mees. If aircraft could fly high enough, it would be possible to photograph an entire country the size of Belgium, Holland or Ireland in a single exposure. Actually, infra-red plates now are so perfected that, flying four miles over Dayton, Ohio, you could photograph Detroit, Mich.

Herald Examiner. 10/8/31

a2059



COLOR DIVISIONS IN THE SUN SPECTRUM

SHOWING THE RANGE OF HUMAN VISIBILITY

INFRA-RED	INVISIBLE
RED	VISIBLE LIGHT
RED-ORANGE	
ORANGE	
YELLOW	
YELLOW-GREEN	
GREEN	
BLUE-GREEN	
BLUE	
VIOLET	
ULTRAVIOLET	INVISIBLE

Group Photo Taken by Invisible Light in Pitch-Dark Room; Right, Color-Division Chart; Below, Views of Yosemite Valley Taken on Extreme Red-Sensitive and Ordinary Plates

Such long-distance photographs are taken by placing a color filter over the camera lens, so that all light visible to the eye is absorbed and prevented from acting on the chemically sensitive plate. Of course, the panorama is bathed with sunshine, much of it invisible.

In astronomy, the infra-red plates have made it possible to photograph the spectra of stars three magnitudes fainter than could heretofore be caught and have proved that the planet Mars has an atmosphere.

Infra-red photography is now possible to the amateur. By equipping his camera lens with a suitable filter to cut out visible light, and using infra-red-sensitive plates, it is possible to get long-distance results with a relatively short exposure.





PURIFY AIR IN STREET CARS BY CHEMICAL TREATMENT

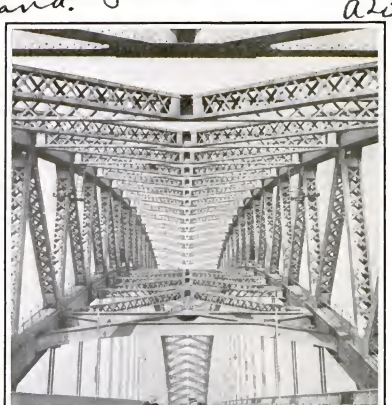
One English transportation company is experimenting with a system for air-conditioning its trolley cars. One street car has been equipped with ventilators which automatically change all the air in the car at three-minute intervals, and it also has a chemical disinfecting system, the solution being forced into the air to kill germs as it comes in contact with them although it is harmless to passengers.

TIME AT ANY PLACE IN WORLD TOLD BY GLOBE CLOCK

Perfectly reproducing the motions of the earth, the basis of all time measurements, an automatic clock that is really a miniature world now tells the time at any point on the globe. Set in the base is an electric clock which controls the movements of the globe. The exact hour, minute and second of the day or night, the hours of darkness and daylight, sunrise and sunset, day of the month and season of the year at any point can be told at a glance. The axis of the globe is inclined twenty-three and a half degrees, just as is the earth. Inside the sphere is a small contrasting electric light revolving once a year. It shows the hours of daylight and darkness, and the times of the sun's appearance and disappearance at any point.



¶Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.



© International Newsreel

A Section of the 1,675-Foot Arch Span of the Kill Van Kull Bridge, Linking Staten Island with New Jersey

BRIDGE LIKE IRON SPIDERWEB HAS LONGEST ARCH SPAN

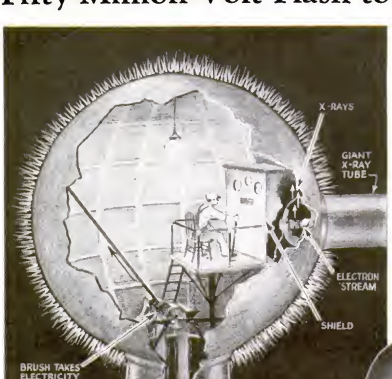
For the moment, at least, New York can boast the longest suspension bridge and the structure with the longest arch span. The recently completed Kill Van Kull bridge, linking Staten island with New Jersey, has an arch span of 1,675 feet, and the new George Washington bridge has a central suspension span of 3,500 feet. The arch of the Kill Van Kull bridge is as graceful as it is strong, and resembles a huge iron spiderweb.

SHIP-TO-SHORE PHONE SERVICE AVAILABLE ON FIVE LINERS

Five transatlantic liners now are offering ship-to-shore telephone service, enabling passengers to communicate directly with persons ashore by radio-telephone. Telephoning to a person in mid-Atlantic thus is as simple as land communication. The ships so equipped are the "Homeric," "Leviathan," "Olympic," "Majestic" and the "Empress of Britain."

12337 Cont. Wm Glassman
55 W 86 St, New York

Fifty-Million-Volt Flash to Smash the Atom?



Drawing Shows How Energy Is Built Up on Surface of Sphere; Right, Simple Form of Generator

Two fantastic dreams of man—transmutation of the elements and liberation of the energy stored in atoms—have been brought a step nearer actuality by the recent development of a simple and inexpensive form of high-voltage generator with which scientists hope to produce electric potentials of up to 50,000,000 volts. Such an apparatus is to be built at the Massachusetts Institute of Technology from the designs of a young experimenter, Dr. Robert J. Van de Graaff, who utilized a century-old electrical principle in making a small generator, recently demonstrated, which developed 1,500,000 volts, although it cost less than $100. The simplicity and economy of the machine bring high voltage within the reach of almost everyone, for the apparatus consists only of two hollow copper spheres mounted on cylindrical glass rods which in turn are supported by triangular bases. At the base of the rods are small motors which drive continuous silk ribbons over pulleys and up inside the spheres. The silk belts are the charging devices carrying electric energy up into the spheres where it is drawn off and runs to the surface, leaving the interior without charge. One such sphere holds the positive charge, and the other a negative one until a tremendous amount of electric energy is stored, to be released by a spark discharge. This relatively simple machine employs static electricity, and the principle is similar to getting a spark by rubbing a cat's fur. The larger apparatus to be built at the institute will have fifteen-foot spheres, about six times as large as those used in the recent demonstration. Among important uses to which this apparatus may be put is the making of X-rays of a penetration comparable to gamma rays from radium.



Goodyear Rubber Co. A2364
Akron, Ohio

AUTO TIRES RUN UP HIGH "FEVER"

A2417

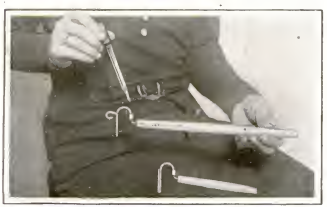
Automobile tires, under continuous runs, generate such heat that in some cases their temperature mounts to 200 degrees Fahrenheit. This fact was revealed in recent tests in which a series of temperature readings was taken. Other tests with air-cooled tires in which many holes run through the tread, revealed a temperature difference of as much as thirty-six degrees between these and the ordinary type. As the air-cooled tire is cushioned against the road, the holes are compressed and heat is expelled. As they expand they draw in cooling air. Truck tires ran a temperature of as much as 230 degrees.

Auto Tires 11/2/31

A2297

FLEXIBLE PERCHES FOR CANARY BIRD DESTROY MITES

A new perch for songbird cages is fastened at only one end through a spring. When the bird jumps onto it, it swings like a twig in a tree. A small glass cup around the spring is filled with a mite-destroying solution, giving the pet freedom from these pests.



Perch That Gives Bird the Spring of Natural Twig Also Rids Him of Insect Pests



Plane and Camera Helped Astronomers Observing the Leonids; Long Streaks on Photograph Indicate Meteors, Short Streaks, Stars

PLANE AID TO ASTRONOMERS IN STUDYING METEORS

Camera and airplane helped astronomers in their study of the Leonids, rare shower of meteors, at Las Vegas, Nev. The plane was used to climb above drifting clouds to get a closer view of the streaks of fire, while the camera drew a remarkable picture of the meteors. Long streaks were left on the photographic plate by the Leonids, while the stars left shorter white lines, the result of the earth's motion in thirty minutes.

¶A twelve-inch steam whistle consumes 400 horsepower.

Hendrys Co
82 Audubon St
New Haven Conn
Mount Wilson Observatory

a2149 Amb. Leon Islaesman
55 W 86 St. New York

The MAN BEHIND



Above, LeFevre and Lotti, French Flyers, Consulting Dr. James Kimball, Government Meteorologist; Below, Testing Blueness of Sky with Color Chart

AT THE close of the 1931 flying season nearly 500 individuals had crossed the Atlantic in aircraft. The year witnessed the record-breaking long-distance hop of the "Cape Cod," from the United States to Turkey, and the swiftest round-the-world whirl by Post and Gatty in the "Winnie Mae."

In 1931 men proved that they had become expert in the handling of aircraft, and the airplane proved its astonishing dependability. Indeed, every factor connected with transatlantic flying was under control, except the weather. That was the topic of conversation at international round tables where aeronauts and financiers gathered to discuss projects for extending existing air routes to nations overseas.

Those who asked aid from Dr. James Kimball, the weatherman whom every transatlantic flyer consults, learned that the greatest assistance Uncle Sam can offer now falls short of what is necessary for a regular transatlantic air service.

a2149

Ocean Flight HEROES



British Bombers in Clouds; Right, Observer Using Theodolite to Watch a Free Balloon

Doctor Kimball's fame as a transatlantic weather prophet began with the Lindbergh and Chamberlin flights. He started Lindbergh off on the great circle at an hour when flying conditions were unusually favorable over most of the Atlantic.

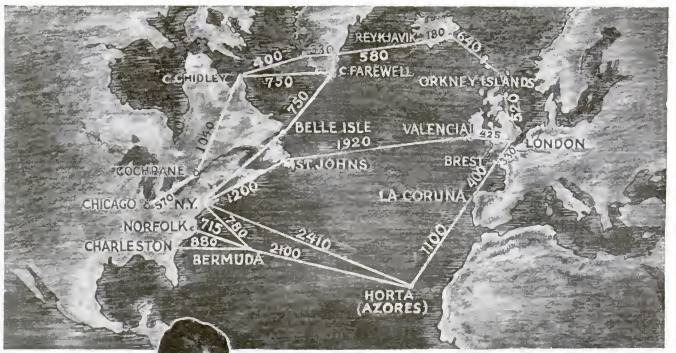
The recent adoption of three-dimension weather maps for land stations provides government and commercial flyers with information of what goes on in the air lanes as well as on the ground. A three-dimension weather map of the high seas is the dream of flyers, but is so remote at present that one can hardly consider it. "We should be content," said Doctor Kimball, "if we had sufficient reports only about what happens on the ocean's surface."

In the light of his experience, Doctor Kimball believes that a transatlantic flight without the following conditions should be classed as a stunt:

1. A well-conditioned plane with a flying radius twenty-five per cent in excess of the ocean hop, and a crew of two.



42149





Top, Transatlantic Air Routes Proposed by Doctor Kimball; Below, Transmitting a Weather Map by Teletype

routes and less hazardous than the great circle.

The problem of operating commercial airship routes across the Atlantic is fraught with problems different from those which confront airplane operators. An important study of transatlantic airship routes has just been completed by the International Zeppelin Transport corporation, under the direction of Comm. J. C. Hunsaker, vice president of the Goodyear Zeppelin corporation, who predicts that a weekly year-round service between Washington and Paris would have an eighty-per-cent efficiency.

Commander Hunsaker, who was chief of the navy's aircraft-construction forces during the war, has conducted many theoretical flights across the Atlantic by airship. With data assembled for the weather bureau by ocean vessels over forty years, he has completed 500 voyages, during which he found that gales sweep the great-circle course about one-third of the time, and fog prevails off the Grand Banks one-third of the time, indicating that, in winter, the airship must follow a southerly route.

The feasibility of south-Atlantic routes for airplanes is less certain than that of north-Atlantic routes, although about a dozen airplanes have already flown from

2. A pilot who can fly blind both night and day.

3. A navigator who can check his course and instruments astronomically.

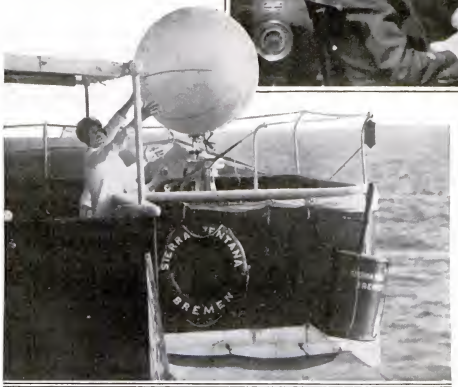
4. A radio operator who can talk freely with other operators.

The route most favored by Doctor Kimball is the steamship route. The distance is shorter than the arctic and Azores

a2149

Europe or Africa to South America. The French government, having the greatest faith in the airplane's supremacy, and hoping to dominate the south Atlantic, has under construction a large fleet of seaplanes designed especially for long-distance flights. The inauguration of a regular fast-mail service from Paris to St. Louis, Senegal,





Courtesy North German Lloyd
Above, Radio Operator on "Leviathan" Receiving Weather Reports from Land Station; Below, Releasing Meteorological Balloon from Ship

Africa, and the east coast of South America is scheduled for the near future.

The latest meteorological survey of south-Atlantic flying weather was undertaken by the North German Lloyd steamer "Sierra Ventana," on behalf of the German government in preparation for the flight of the world's largest seaplane, the "DO-X."

Under the direction of Capt. D. Ballahr, officers of the vessel conducted a series of balloon observations on the voyage from Bremen to Rio de Janeiro. The trial balloons were forty inches in diameter and, when filled with hydrogen gas, were sent aloft two or three times daily. Ship officers watched their flights through the atmosphere with a theodolite, and after tabulating the results, they radioed the information to the German weather observatory, which in turn advised navigators of the "DO-X" on conditions which might be expected.

These balloons were so constructed and adjusted that they rose into the atmosphere at a regular rate of about 900 feet per minute. Theodolite readings were taken every minute of the height, direction and speed. These data were then charted on the same map which marked the course of the "Sierra Ventana." Thus they arrived at fairly accurate information on the relation between surface and stratospheric wind movements.

In clear weather, the balloons were observed at heights of 60,000, 65,000 and 70,000 feet. The highest altitude at which a balloon was observed was 91,000 meters —or fifty-six miles! (The world's altitude record for human beings is ten miles.)

Only expert observers could have followed the erratic flights of these balloons. They frequently traveled at airplane speeds; several times they were seen to exceed 150 miles per hour. One of the balloons, which had reached an altitude of about 70,000 feet, was visible for a little over an hour.



Backing Your Car Out Is Unnecessary if the Garage Has Turntable

TURNTABLE FOR HOME GARAGE MOVES AS DOOR OPENS

Backing the automobile out of the private garage would be unnecessary if you owned a "gyrogarage," which has a turntable on which the car moves as the door opens. The auto is driven in and half turned as the door closes. When the door is opened from the other side, the auto completes the revolution, and is ready to be driven out. The inventor has constructed a model of the gyrogarage, and claims that a private garage equipped with the turntable can be built almost as cheaply as the ordinary one.

SHIFT IN SAXOPHONE CONTROLS MAKES IT EASIER TO PLAY

Shifting the octave mechanism from the upper to the under side of the mouthpiece and installing a swivel thumb rest, are two improvements making the saxophone easier to play. The change in octave controls is designed primarily to protect the delicate mechanism against careless handling. In its old position on top of the mouthpiece, the octave key was easily bent or broken. The swivel thumb rest moves with the thumb regardless of the position in which the instrument is held, adding greatly to the ease of holding and playing.



WOODEN DOOR RESISTS FLAME BY EXHALING CHEMICALS

Chemically treated wooden doors resist fire six times longer than a metal-covered door, it has been found in recent tests. A door, two inches thick, held back flames for one hour, exhaling fire-extinguishing chemicals when it was subjected to heat. The chemicals formed a wet skin on the surface, and the molecules of the layer exploded at the touch of fire, throwing off tiny sprays of fire-extinguishing fluid. As this layer burned off, new films formed underneath. Smoke poured through the joints, and flames appeared in ten minutes when the metal-covered door was tested. The door saturated in chemicals resisted until the wood was one-eighth inch thick.

EXTRACTOR FOR BROKEN BOLTS MAKES WORK SIMPLE



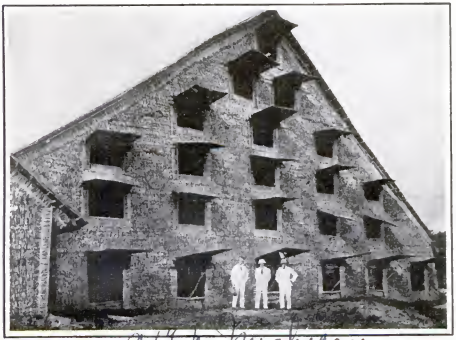
Mechanics and others who are afraid to "lean" on capscrews or stud bolts for fear of breaking them, now may turn them up as tight as necessary, and if they snap, their removal is an incident rather than a time-consuming operation. The extractor outfit consists of drills of various sizes, with each of which is provided a fluted steel extractor of corresponding diameter. A centering bit and guide also is furnished to start the drilling. The hole is bored in the broken stud, the extractor of the correct size tapped in, the wrench head fitted and the shell turned out. Heavy-duty extractors also are provided for locomotive and other large studs. It is not necessary to dismantle the job before the extractor can be brought into play.

LIGHT BULB GLOWS FOR HOURS WITHOUT ELECTRICITY

Light bulbs that glow continuously for six months without electric current to light the filaments may be used for illumination in the future. This prediction was made recently by Prof. Charles T. Knipp, before the American Physical society, after he had outlined his experiments with a bulb filled with nitrogen gas. Afterglow from this lamp has given light for as long as three hours after it had been charged with an electrical flash for one-tenth of a second. Brilliance of the nitrogen lamps was found to increase, rather than decrease, over a certain period of time. The flow was described as bright enough to permit reading by its illumination, and yellow in color.

ANCIENT IDEA OF INSULATION SERVES MODERN PURPOSE

Straw-thatching, which gave ancient and many present-day savage races an insulated and water-shedding roof, has been employed for a modern purpose in Sumatra. A giant shed has been constructed there, built entirely of straw, for the curing of tobacco. Many openings are provided for the free passage of air at dry periods of the day, while, at night and in damp weather, the openings are closed and the straw keeps out the moisture.



Courtesy Celotex Co.
Shed Built Entirely of Straw Is Found Best for Curing Tobacco in Sumatra's Rapid Climatic Changes



By Checking Battery with "X-Rayoscope" You Can Tell Quickly the Condition of Its Individual Cells

HOW GOOD IS BATTERY SHOWN BY "X-RAYOSCOPE"

How good or bad your battery may be, and whether the trouble is in one cell, two or three, is quickly determined with an instrument named the "X-rayoscope." It is in appearance much like the stereoscope that once adorned every library table, fitted with wires for attaching to the battery. Three stars are visible inside the visor, and if they all show green, the battery is a good one. If they are green and red, the battery is fair, and if deep red, it is dead. If one of the stars is of different appearance, the relative value of the corresponding cell is indicated by the color.

¶A British meteorologist estimates that the world gets an average of 44,000 thunderstorms a day.

a1967 Carl. Charles J. Culbert
c/o Chicago Daily News
Radio Dept. Chicago

Around the World on the Air with Radio



Above, Radio Entertainers Broadcasting the Music of Japanese Instruments from the Internationally Known Japanese Station JOAK, Tokio; the Microphone Is on the Pedestal at the Left; Right, Amateur Operator in Siberia Who Has Worked Many Distant Stations as Shown by Reply Cards on Desk





Above, the United States Signal Corps Radio Station in Nome, Alaska, after a Storm; Right, XEW, Powerful Station at Mexico City, Heard Regularly by Americans on Both Long and Short Waves

a 1967

For Stations You May Hear But Never See



Above, American Marines in Nicaragua Killing a Snake before Setting Up Their Portable Radio to Talk with Headquarters; Right, Tower of a Berlin Radio Station Lighted as a Beacon for Aviators; the Mast Has an Open-Air Restaurant about Its Middle





Left, Radio Operator and Portable Set of a Sound-Movie Company in the Wilds of Brazil; Station KUKU Was in Constant Touch with United States Amateurs



Right, in Far Ceylon, the Amateur Radio Operator Works His Short-Wave Set and Brings a Thrill to the Amateur in This Country Fortunate Enough to Pick Him Up; This Distant Amateur Is Seated before His Receiver Bringing in Code

a2393
Christian Science
Monitor 1/28/31

WEARY WAITING IS OBVIATED BY RENDEZVOUS TABLET



Public Meeting Place Provided with Message Tablet
So Long Waiting Is Unnecessary

If the person with whom you have an appointment in Hannover, Germany, fails to appear on time, it is no longer necessary to stand around and wait wearily for him. Hannover has set up a tablet at the intersection of eight streets and marked it off into a number of squares. The first person at the appointed spot needs merely to write in one of the squares where and when he can be found. The tablet has proved exceedingly popular.

FILM OF OIL SUSTAINS WEIGHT OF QUARTER TON AN INCH

a2415

Oil films two ten-thousandths of an inch thick have been found to support weights averaging almost a fourth ton per square inch. The films are formed in high-speed machine bearings, and their performance was found in experiments at Pennsylvania state college, which showed oil films capable of carrying these extreme weights can be had simply by placing the oil holes properly. When that is done, "riding on oil" becomes a literal fact. The hub of a wheel turning on its axle illustrates what the testing devices disclosed. The weight rests on top of the hub, pressing it against the axle which supports it, with the expected result that underneath the axle there is more space than on top. As the wheel speeds up its revolutions, oil is dragged upward into the narrow top area and compressed until it acquires tremendous weight-sustaining power, the maximum compression rising faster than the weight as the latter is increased. On the test machine, 100 pounds of weight resulted in a maximum of 250 pounds to the square inch compression in the oil film, but a weight of 400 pounds produced a maximum oil-film pressure of 1,400 pounds to the square inch. Although almost too thin to be visible, the oil film at this compression completely separated the two metallic surfaces, but at weights above 400 pounds, the oil film began to break down.

CLOCK DIAL FOR TESTING EYES WARNS OF ASTIGMATISM

a2164

Black-striped circles on the dial of a clock now on the market will reveal eye trouble. If the circles do not appear equally black, then there is reason to believe that astigmatism is present. The circles, of alternate black and white stripes, are in the place of the usual numerals. The principal use of the clocks is to warn of the need for an eye examination.



Striped Circles Warn of Eye Trouble if They Do Not Appear Equally Black

State College Pa
Prof Louis J. Bradford

Bausch & Lomb
Optical Co
Rochester, N.Y.

a 2271

Police Rookies Use Masks in Gas-Attack Drill



They Might Easily Be Taken for a Group of Goblins Out of a Fairytale, but Actually They Are Police Rookies at Philadelphia's Training School Learning to Use Gas Masks

One of the steps in developing Philadelphia's future policemen at the city's training school is to teach the rookies how to use gas masks in case they are called on to enter gas-filled homes or to repel gas attacks of criminals. In such a drill, the student policemen all don the masks simultaneously and enter a gas-filled room where they learn immediately if their masks are worn in the proper way to be effective. A recent picture of a squad of rookies about to undergo a baptism of gas might easily be mistaken for a group of goblins out of a fairytale.

a 2347

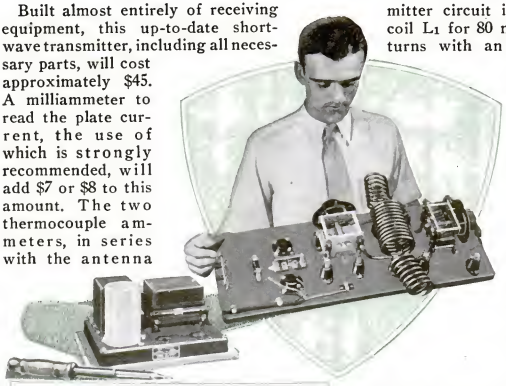
WEATHER MAKING FOR HOMES OPENS NEW INDUSTRY

Making comfortable weather for homes and office buildings is likely to develop into a $250,000,000 industry within the next twenty years. This is the prediction of Thornton Lewis, a heating and ventilating engineer, who finds that the manufacture of weather for buildings has become an exact science within the last twelve years. One of the latest applications of manufactured weather is in the air conditioning of railway cars, but air conditioning of homes is hardly started, and few office buildings, hospitals or churches have any provision for controlling the temperature or humidity of the air that is used, except by ordinary heating methods. Growth of this industry, it was predicted, will result in an increased consumption of electrical energy, and may mean improved conditions in the ice industry, since ice is being used for air conditioning in homes and small installations, for which over 150,000 tons will be needed, he estimated.

Newark, NJ Probably Carrier Eng. Corp. 848 Frelinghuysen Ave Newark N.J.

Push-Pull C.W. Transmitter Is Easy to Build

Built almost entirely of receiving equipment, this up-to-date short-wave transmitter, including all necessary parts, will cost approximately $45. A milliammeter to read the plate current, the use of which is strongly recommended, will add $7 or $8 to this amount. The two thermocouple ammeters, in series with the antenna



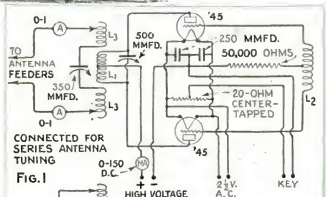


FIG. 1

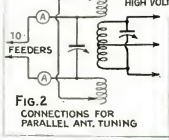
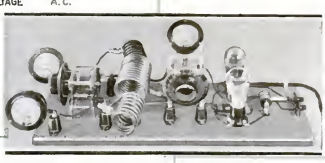


FIG. 2
CONNECTIONS FOR PARALLEL ANT. TUNING



mitter circuit is shown in Fig. 1; coil L_1 for 80 meters consists of 12 turns with an inside diameter of 2⅜ in.; for 40 meters, 8 turns and inside diameter 1⅝ in.; for 20 meters, 4 turns and same diameter. All L_1 coils are made with ¼-in. copper tubing. The L_2 grid coils are wound on 1-in. forms and are tapped in the exact center. When completed, these coils should be coated with collodion. Grid coil L_2 for 80 meters consists of 72 turns of No. 32 s.s.c. wire; for 40 meters, 40 turns of No. 28 d.c.c. wire; for 20 meters, 16 turns of same-size wire. The two L_3 coils consist of 7 turns of ¼-in. copper tubing and have an inside diameter of 1⅝ in. These coils are not changed for the various wave bands. Complete material list and further details are available. Fig. 2 shows connections for parallel tuning, and the power unit diagram is given in Fig. 3. Coils L_1 and L_3 are mounted on small porcelain stand-off insulators. The grid coil L_2 is clipped into a standard resistor mounting as shown.

feeders, are not absolutely necessary, but are very helpful in tuning. The set is not a toy or flea-power outfit in any respect. It is intended for practical communication and will do anything that the type 10, in common use, will and better at greatly reduced cost. The baseboards for both the transmitter and power supply are of the same size, each being half of an 18 by 26-in. breadboard. A commercial power-supply unit for this transmitter is shown in the upper photo, and the home-made type at the lower right. The trans-

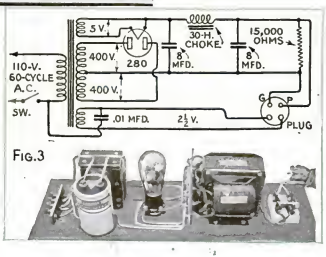
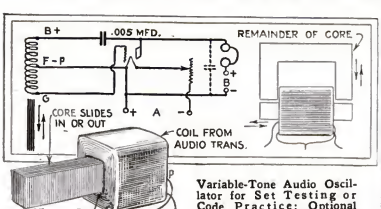


FIG. 3

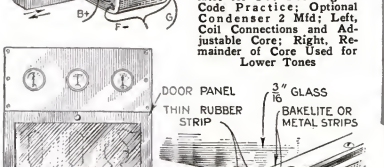
Practical Ideas for Radio Experimenters



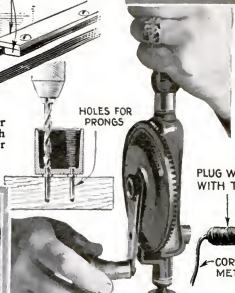
Variable-Tone Audio Oscillator for Set Testing or Code Practice; Optional Condenser 2 Mfd; Left, Coil Connections and Adjustable Core; Right, Remainder of Core Used for Lower Tones

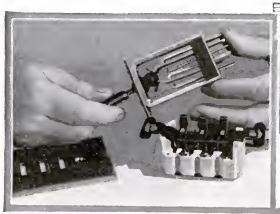


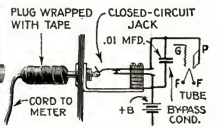
Above, Radio Speaker for Outdoor Advertising Installed in Hub Frame of Spare Wheel; the Homemade Grill Is Backed with Wire Mesh; Left, Using Hand Drill for Removing Prongs from Tube Bases When Shell Is Required for Choke-Coil Form; Base Is Held for Drilling as Shown



Glass Doors for Amplifier or Transmitter Fronts; the Glass Is Held in Position with Strips and Machine Screws; Thin Rubber Strips Prevent Cracking





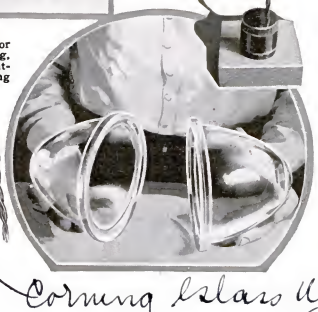


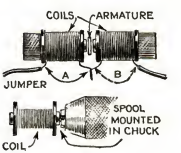
Single Milliammeter May Be Used to Check the Plate Current of a Number of Different Tubes in Amplifier Hookup, if Closed-Circuit Jacks Are Installed as Shown

Anti-Capacity Switch for Table or Panel Mounting, Handy for Radio Experimenters and Service Men Making Comparative Tests



Plug and Jack Made from Auto-Lamp for Test Equipment; Right, Pyrex Bowl Lead-In Insulators for Amateur Stations





Above, to Repair Open Voice Coil in Speaker, First Short One Coil and Then the Other, as Shown, While Set Is On to Locate Open Winding; Unwind Coil, Repair the Break and Rewind the Coil in a Hand Drill

Corning Glass Works
Corning, NY

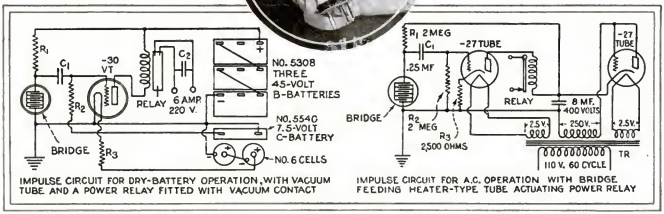
Burgess Battery Co.
295 Madison Ave

Simplified Light-Control Units

A new light-sensitive cell, recently introduced in this country, is known as the radiovisor bridge. It consists of a tall glass tube with a



a second relay, provided with a vacuum contact device, enables handling several hundred watts for practical work. For more intricate applications, radio tubes can be employed in



Light-Sensitive Cell and Impulse Circuits, for Both Battery and A.C. Operation, That the Experimenter May Build with Standard Parts to Control Other Electrically Operated Apparatus

three-prong base. Inside the bulb is a flat plate supported by two heavy lead-in wires. Owing to the considerable amount of current that can be passed through this cell, as compared with the usual photo-electric cell, it is claimed to greatly extend the possibilities of light-control. It may be used to operate a relay direct for controlling a circuit of a few watts, while very simple circuits owing to the higher initial current available. The bridges are supplied in both a.c. and d.c. types and the circuits for the operation of each are given. In England and Germany, the bridge and associated equipment have been applied to burglar and fire alarms, street-lighting control, fog detectors, automatic counting, color matching, etc.

Dynamometer Is Run by Battery

Battery-operated dynamotors are now being used in auto radio installations to provide the necessary high B-voltage. They operate from a 12-volt storage battery and deliver about 220 volts of direct current. This is more than sufficient for the average auto set, and will be found suitable for operating many standard receivers in rural districts where farm-lighting plants are in common use. The square box, on the top of the machine, houses a terminal strip and a small filter unit, consisting of two condensers and two chokes. It is claimed that all ripple and noise are eliminated with this filter. The device occupies little room and may be housed in a standard battery box installed below the floor.



Electrical Specialty Co
Stamford, Conn

Protecting Tubes in Short-Wave Sets

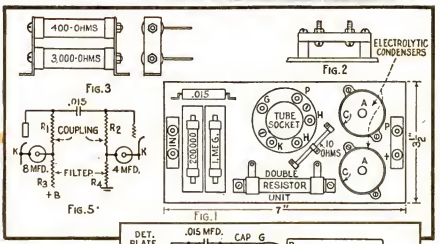
The new type 30 tubes, used in short-wave sets, require a filament-battery voltage of 2.2, and this should not be exceeded, or the life of the tube will be greatly shortened. A d.c. voltmeter should be connected permanently across the filament of the tubes. One meter may be used for all tubes, as they can be connected in parallel and served with a single rheostat.

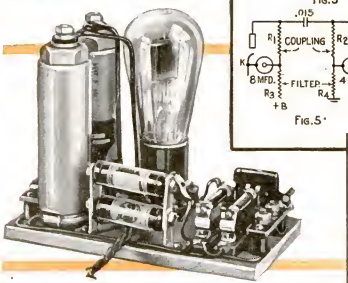
¶For further information on any radio construction article write to the radio department; this service is free.

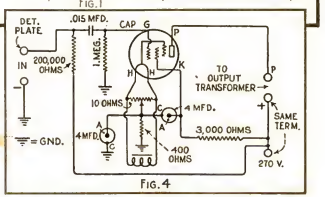
Pentode Amplifier without Altering Old Sets

The new pentode power-amplifier tube may be added without dismantling the audio section of the receiver. Later, if the builder is satisfied with the performance of the new tube, he can easily make a permanent installation. All parts are mounted on a 3½ by 7 by ⅛-in. metal base. The layout is clearly shown in Fig. 1, A on the electrolytic condensers indicating the insulated terminal and C, the container can which is the other terminal. These connections should be made exactly as in the diagram. Fig. 2 gives the details of the input and output terminal strips; Fig. 3, the double resistor assembly, and Fig. 4, the complete wiring diagram. The .015-mfd. condenser and tapped filament resistor are not to be fastened with screws. The condenser terminals are soldered directly to the coupling-resistance mountings, and the tapped resistor to the socket terminals. A separate 2½-volt 1½-amp. filament transformer is used, and the 270 volts for the plate is

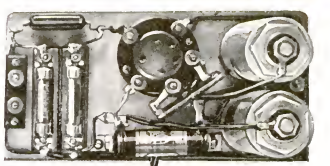








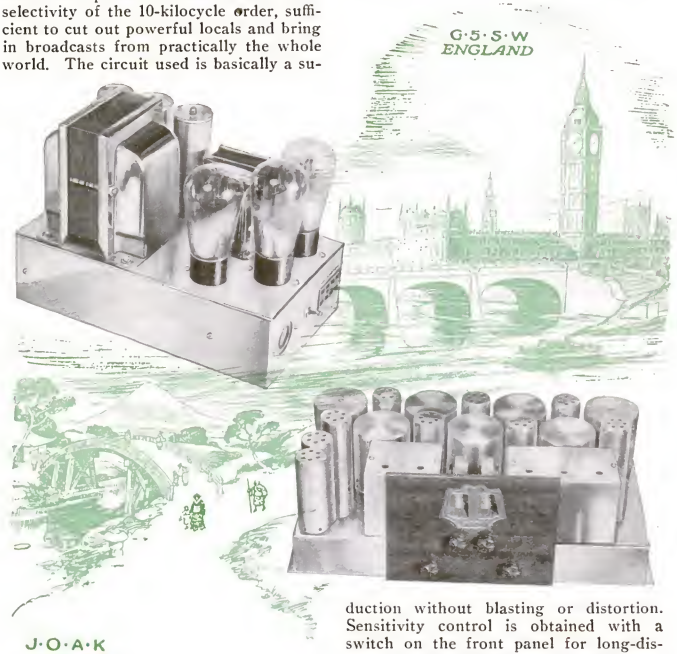
taken from the set supply to the output. The present speaker transformer primary is connected to the output terminals. The amplifier input is connected directly to the detector-tube plate in the set, and all other audio equipment is discontinued. Fig. 5 shows an optional resistance and capacity coupling where both plate and grid circuits are filtered for maximum results. R_1 and R_2 are the same as used in Fig. 4; R_3 is 50,000 ohms, and R_4 100,000 ohms.



The E. H. Scott Radio Laboratories
Inc. 4450 Ravenswood Ave
Chicago

All-Wave Super Tunes from 20 to 550 Meters

The pleasure of hearing programs on all waves not only from this country but from far-distant lands is no longer confined to the laboratory. The sonorous chimes of a bell tolling the hours may float into your home over the evening air, and, shortly, a voice may tell you it was Big Ben, in the House of Parliament in London, that just struck the hour of midnight, and wish you goodnight. Your watch tells you it is just 6:00 p.m. in Chicago. This custom-made superheterodyne is designed and built for the necessary sensitivity to bring in this station, and others 10,000 or 12,000 miles away, with loud-speaker volume. Tests show selectivity of the 10-kilocycle order, sufficient to cut out powerful locals and bring in broadcasts from practically the whole world. The circuit used is basically a superheterodyne with 12 tubes, consisting of a stage of r.f. amplification using a screen-grid-type 224-tube. The first detector employs a 224-tube, the oscillator a 227, and three stages of extremely high-gain intermediate-frequency amplification is obtained with type-224 tubes. The power second detector employs a 227-tube; two push-pull audio stages are used, the first having two 227's and the second two type-245's. This last push-pull stage with a type-80 power unit is separate from the receiver, as shown in the upper photo, and is designed to handle the high output of the second detector for faithful reproduction without blasting or distortion. Sensitivity control is obtained with a switch on the front panel for long-distance, medium-distance and local recep-

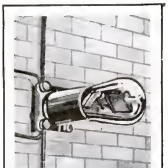


tion. Complete shielding, careful balancing and precautions to prevent changes in coil characteristics, due to climatic changes, are special features.

Prolonging Life of Rectifier Tubes

All types of rectifier tubes should be operated under conditions that provide good ventilation. Tubes of the 80 or 81 variety may be housed in metal cabinets provided holes are drilled in the cabinet. Heavy-duty rectifiers, such as the type 866, should not be boxed in a metal cabinet. They should be mounted in breadboard fashion and placed in a safe location where there is free access of air. When these tubes are to be worked near their maximum output, it is sometimes necessary to force circulation around the bases by means of an electric fan. With these tubes, as with any rectifier tube, the rated filament voltage should be carefully maintained. Running the filament at lower than normal specified voltage shortens the life of the tube. All rectifier tubes of the mercury-vapor type should be given ten or fifteen minutes to heat up before the plate voltage is applied.

Old Tube as Lightning Arrester



A burned-out tube may be inserted in a socket and mounted inside or on the outside of the building as shown, to act as an inexpensive lightning arrester. The antenna and ground leads are connected to the grid and plate terminals of the socket. The small space between these elements and the high vacuum, provide an easy path for static voltages.

Labels for Tube Records

Tubes tested at regular intervals should be marked with the result of each test so that earlier readings may be compared with the one just taken. Small gummed labels pasted on the bases provide a handy means of keeping these notes.

Grandfather Clock Houses Radio Set



Electric Grandfather Clock Showing Radio-Control Panel and Speaker

Built into a cabinet closely following the lines of a colonial grandfather clock, this 8-tube superheterodyne receiver is 66¾ in. high, 16 in. wide and 10¾ in. deep. An electric clock and auditorium-type dynamic speaker complete the assembly. Variable mu tubes are employed in the circuit, and push-pull pentode tubes in the output.

Improved Binding-Post Strip

Unnecessary service calls may be avoided by the general use of an improved binding-post strip in which it is not so easy for the antenna to touch the chassis and ground. The wire guide takes any size wire and holds it away from the metal chassis. A tinned soldering tab is provided for the ground post.



Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; material lists are always available without charge.

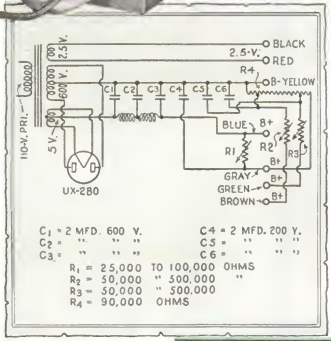
POWER for Amateur-

By ROY E. DAVY

PART II

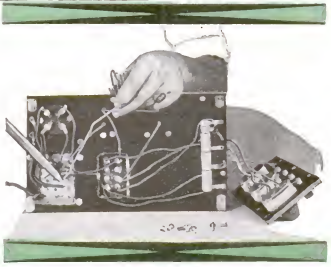


ANY good B-eliminator with two variable voltage taps and an output of at least 200 volts at 40 milliamp., may be used with the special amateur-band receiver described in the January issue. In this case it would be necessary to provide a separate filament transformer to deliver 2½ volts at 6 amp.



The complete power unit now illustrated and described was designed and built especially for this receiver. It is quite simple and operates perfectly without noticeable hum. The complete installation has been in use for several weeks and is giving excellent results on both c.w. and phone. Experienced short-wave listeners have found that maximum results with a short-wave receiver are much more easily obtained if a means of varying the plate and screen voltages is provided. This is a feature of the present unit.

The metal container is 12 in. long, 7 in. wide and 7 in. deep. It may be made from copper, brass or eraydo, as desired. The bottom and top covers are turned down ½ in. all around to make a snug fit. The bottom is soldered in position and the top is left removable. A number of ventilating holes are drilled in the sides and top. An opening, 2½ in. wide and 6 in. long, is cut in one end for the bakelite control panel, which is 3 in. wide and 6 in. long. Machine screws on each side hold this panel in position. The three carbon-type variable resistors and five binding posts are then mounted on the panel. All other parts are mounted on a ¼-in. bakelite subbase, cut ½ in.

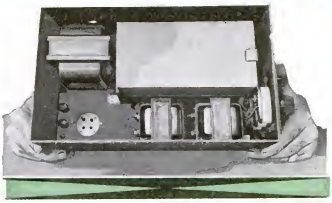


SUPPLY
Band Receiver

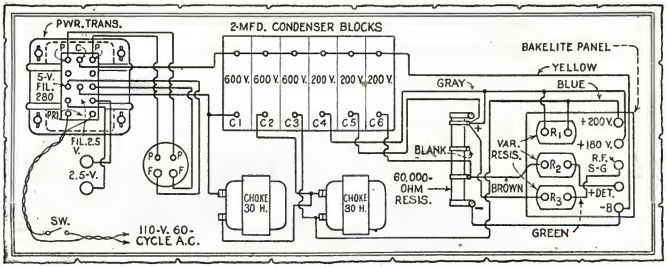


smaller in diameter than the inside of the box. The sub-base is elevated above the bottom of the metal container by means of 1-in. angle brackets screwed to each corner. This allows much of the wiring to be done below the base, as shown in the lower photo on page 296. The voltage divider R_4 is mounted at the right.

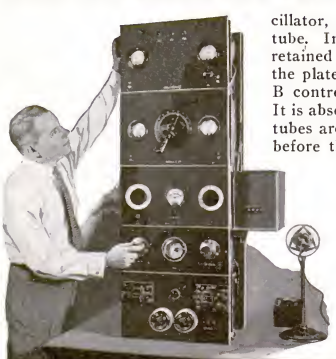
Holes are cut in the sub-base for the transformer, socket and condenser-block terminals. A standard type-245 condenser block, with all terminals grouped on one side, was used to save space. If single condenser units are preferred, it may be necessary to enlarge the metal case. The two binding posts for the 2½-volt filament supply are mounted on the left end of the base, as shown in the center photo on this page. Material list and enlarged diagrams are available.



The power transformer has a 600-volt center-tapped winding and also supplies the necessary filament voltages. When the wiring is completed, set the clip from R_3, which controls the screen-grid voltage on the r.f. tube, about 1 in. from the positive end of the voltage divider R_4. The clip from R_2, for the detector screen voltage, is moved on the voltage divider to a position about 2 in. from the negative end. The 5-ft. connector cable carries all leads.



Line Controls for the Amateur Transmitter

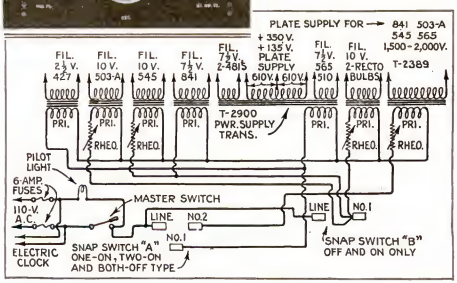


By F. L. BRITTIN

Grouped line controls not only make a better appearance but are necessary in case any tube starts to draw more than normal current. This article, concluding the series on the amateur crystal-controlled 50-watt c.w. and phone transmitter, shows a simple method of grouping the controls. A complete set of enlarged diagrams and a material list covering the installation are now available. Three 10-amp. snap switches are required, the master switch being mounted under the bakelite shelf, that supports the crystal temperature-control oven, at the right on the transmitter frame in the upper photo. Snap switch A in the No. 1 position turns on the filament and plate supply for the oscillator, and the filament supply for the 565 buffer tube. In the No. 2 position, the same connection is retained and an additional contact is made to turn the plate voltage on the other tubes. Snap switch B controls the filament supply to all other tubes. It is absolutely necessary that the filaments of these tubes are allowed to heat for ten to fifteen minutes before the plate voltage is applied. To place the transmitter in operation, first turn on the master switch, then filament-switch B. After the tubes have been lighted for the period mentioned above, turn switch A to position No. 1 and then to No. 2. A good plan is to leave the filament switch B turned to the on-position at all times and cut the station line supply at the master switch. The switch A is turned to the off-position when listening in, but switch B is left on. It would be of advantage to have the oscillator and buffer-tube filaments on a separate transformer. However the present arrangement works out very nicely. The bakelite panel for the filament-supply unit, shown at center, is ¼ by 7½ by 17¾ in. This unit houses the separate 2½, 7½ and two 12-volt filament transformers with the necessary rheostats to reduce the voltage to 10 volts. A 500-watt linear amplifier will be described in an early issue.







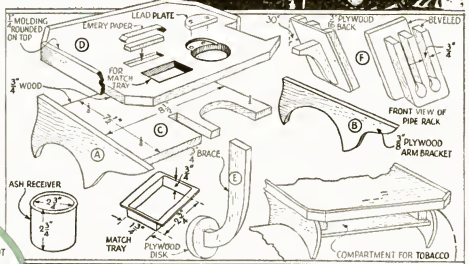
Clear-Deck SMOKING TRAY *fits* EASY-CHAIR *arm*

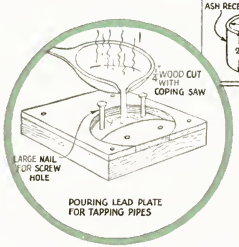
By BOB HARDY

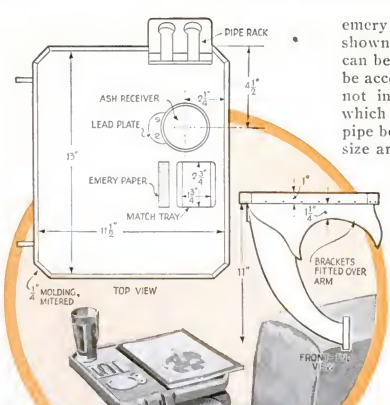


A CARELESS sweep of the arm cannot knock anything overboard from this clear-deck smoking tray, as nothing projects above the ¼-in. "coaming" around the edge, leaving a flat surface for books, magazines, scratch pad, lunch or beverages without interfering with the built-in gadgets. The set rests on the arm of an easy chair, out of the user's way, and can be removed instantly as there are no clamps or screws to hold it in place.

The wood to use is a matter of individual taste, although Philippine mahogany, maple, birch or redwood are suitable for a stained and varnished job and pine will do for a paint or lacquer job. First, a cardboard pattern is made for the arm brackets. Plywood is best for these, as they will not be likely to split and their exact shape, of course, depends on the individual chair. In case the chair arm is level, both brackets can be made the same height, but as most chairs have arms sloping toward the rear, the rear bracket should be higher than the one in front so that the tray will remain level. The arm brackets, A and B, are nailed or screwed to the base block, C, the latter having a slot to receive the under brace, E, and also is cut away to clear the ash receiver. Level it on the chair arm be-







Smoking Tray Has Parts "below Deck," Where They Cannot Be Overturned, and Provides Space for Books and Magazines

emery paper is needed. The pipe rack shown is a "two-passenger" job, but it can be made larger so that more pipes can be accommodated as long as the rack does not interfere with the chair arm beside which it hangs. Drill 1½-in. holes for the pipe bowls in a ¾-in. piece of wood of fair size and cut the outline later. If you attempt to do this after the rack has been cut to size, the wood is likely to split. Use an expansion bit, and cut ¾-in. slots leading to the holes. The rack is backed with a piece of thin plywood, and a brace behind holds it at a 30° angle with the vertical. Around the edge of the tray, nail on a molding, ¼ by 1 in., rounded on top. This can be fastened with round-head screws, brass upholstery tacks or escutcheon nails. Miter the joints neatly. With the tray, D, complete, it can be screwed to the base block, C. On the user's side of the set, between the tray top and chair arm, a compartment can be built large enough to receive a tobacco pouch.

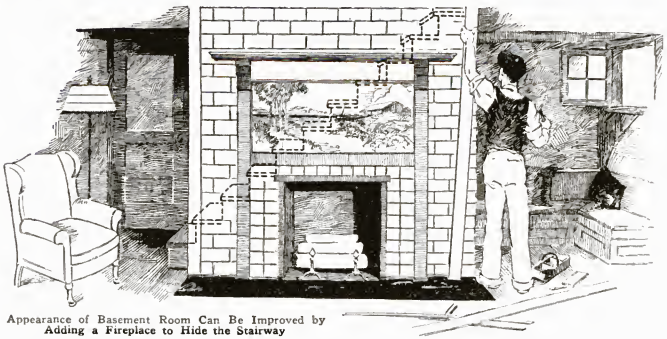
fore fastening the arm brackets permanently, and locate the under brace also. Next, saw out the top from ¾-in. stock, cutting the corners at a 45° angle and making a cut-out for the pipe rack, F, as well as for the ash receiver and the match box, as shown. The recesses for the emery-paper block and the lead plate are chiseled to a depth of about 5/16 in. It is best to mold the lead plate first, as shown in the detail, and then trace its outline on the tray adjoining the ash-receiver hole. A mold is easily made of wood, as shown, using two nails for screw holes. Have the lead very hot before pouring, and use only enough to bring the surface flush with the top of the mold. This results in a neat job that needs no trimming or filing. The recess in the tray top can be chiseled for a neat fit, and the plate held in place with flat-head brass screws, the holes being countersunk with a jackknife so that the heads will be flush with the surface. The ends of the emery paper are folded over a small block of wood that fits loosely in the recess chiseled out for it, so that it can be picked out readily when new

You may be able to find in the stores an ash receiver and match box of brass or copper which approximate the dimensions given, or you may make them yourself of hammered brass or copper. The ash receiver should have a bead or flange around the edge, to prevent it from falling through the opening cut for it, which should be a loose fit to allow easy removal. In finishing, use an oil stain to match the other furniture in the room, and add a dull polish with furniture wax. Some very attractive effects can be achieved with bright enamels, but these have the disadvantage that burns show up prominently. By reversing the design, this tray can be adapted to the right arm of the chair, though most smokers will find the left arm more convenient.

Drying Plaster Patches Quickly

When patching walls before painting or papering, the time required for a patch to dry can be shortened by holding a roll of burning paper over it. The heat drives out the moisture and hastens the drying. —Garry A. Brickman, Sewell, N. J.

Fireplace Conceals the Basement Stairway



Appearance of Basement Room Can Be Improved by Adding a Fireplace to Hide the Stairway

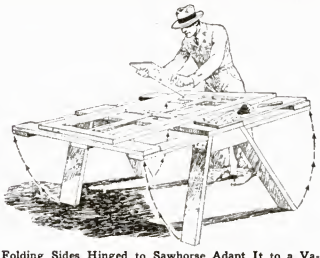
In partitioning off a room in a basement, the problem of hiding the stairway was solved by simply building an imitation fireplace in front of it, as shown in the drawing. The framework consists of 2 by 4-in. stock, upon which pressed wood, with an imitation tile surface, was applied. The fire box was made large enough to contain some wood and extended under the stairway, while the rest of the fireplace served as a partition next to the stairs. Trim of 1 by 4-in. stock was fitted over the pressed wood, and a suitable picture built in as indicated. If a marble slab is available, this may be used instead of the picture. A shelf was added to accommodate knickknacks. It is a comparatively easy matter to build this fireplace which adds materially to the appearance of the basement room. Cozy nooks can be built on each side, with built-in seats, if you desire.—Charles Brinkman, Chicago.

An Aid in Ignition Timing

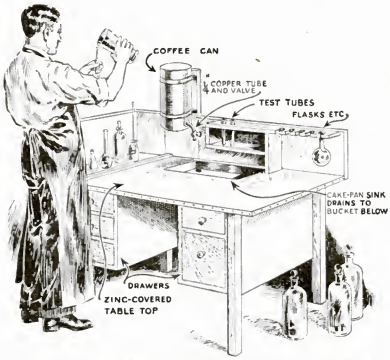
When timing the ignition of the model-A Ford, one often turns past the mark in the gear. This can be avoided by rotating the motor part of a turn backward, then moving it slowly forward again with the crank. To do this, use a heavy screwdriver, inserting it through the spokes of the small fan pulley on the crankshaft. If the fan belt is tight and the motor turns freely, the latter can be moved by turning the fan. This can be done easily if the spark plugs are removed to overcome the compression.

Hinged Sides Increase Usefulness of Sawhorse

Carpenters and odd-job repairmen can use this "winged" sawhorse to good advantage, as it supports a variety of work that would ordinarily require two horses. The wings are made of light lumber and are hinged to the sides of the sawhorse so that they may be raised instantly. They are held in the horizontal position by an arm pivoted to the underside of the top.



Folding Sides Hinged to Sawhorse Adapt It to a Variety of Work

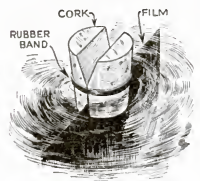


Ordinary Kitchen Table, Fitted with Drawers and Backboard, Provides Laboratory Table for the Young Chemist

Workbench for Amateur Chemists

Fitted with drawers for supplies, an ordinary kitchen table can be made into a workbench for the amateur chemist. Cut a well in the top to receive a cake-pan sink, the inside surface of which is covered with an acid-resisting paint, and solder a short drain pipe in one corner to empty into a bucket placed underneath the table. Then nail a backboard to the edge of the table as shown. A large can for distilled water, having a length of copper tubing, fitted with a petcock, soldered to it, is fastened to the backboard with metal straps. The test tubes, flasks, etc., are kept in wooden racks also nailed to the backboard. The top of the table should be covered with sheet zinc, extending down over the edges and nailed to them, or it, too, may be coated with acid-resisting paint.

Film-Developing Clip from Cork



For the amateur photographer who does his own developing, a film clip made from a cork will be useful, and has the advantage of not marring the films. Take an ordinary cork of a suitable size to float the film and cut it as shown, so that when the two halves are placed together there will be a V-shaped opening at the top. A rubber band holds the film in the clip and pressure at the top forces the halves apart at the bottom to permit insertion of the film.—K. F. Keith, Chicago.

Singeing Frayed Ends of Silk or Rayon Cloth

Many silk or rayon garments are ruined by careless trimming of a raveling or a slight fraying in the cloth. If the thread cannot be worked back into its original position and the broken ends stand out, carefully singe them down with a lighted match. In doing this, the burned part will brush off as ash, leaving little or no trace of having been touched, and the ends of the burned strands will usually be melted together so that there is little likelihood of further trouble.

Short Wire Keeps Pot Handles Cool

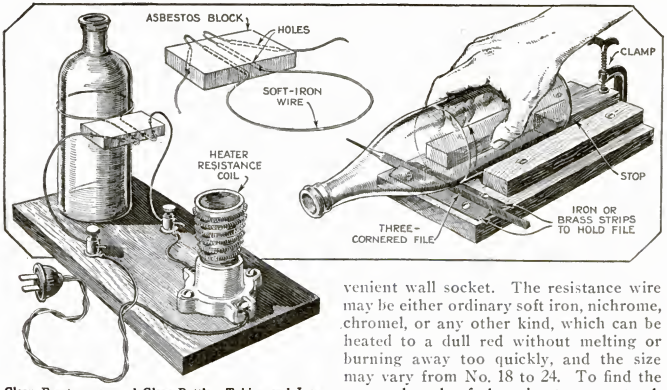


Fastened to the bail of a cooking utensil in the position shown, a short length of wire will prevent it from becoming uncomfortably hot. With this arrangement, the wire strikes the side of the utensil when the handle is lowered, and keeps the latter from touching the hot pan.—L. E. MacNair, Lisbon, Portugal.

Liquid for Fireproofing Cloth

Fireproof liquid for cloth can be made by dissolving ammonium sulphate, 1 lb.; ammonium carbonate, 5 oz.; borax, 4 oz.; boracic acid, 6 oz., and common laundry starch, 4 oz., into 1½ gal. of hot water. The fabric is saturated with this solution, which should first be heated to about 86° Fahrenheit.

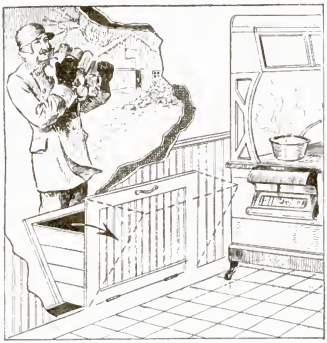
Cutting Bottles by Electrically Heated Wire



Clean Fractures around Glass Bottles, Tubing and Jugs Made by Using Electrically Heated Wire

Lamp bases, pedestals for supporting window displays, forms for winding coils, electrical insulators, glass funnels, gas generators and distillation condensers for the chemical experimenter, can be cut to any desired size by means of a wire heated electrically. The first step is to score the line at which the article is to be cut around it by means of a three-cornered file. An accurate method of doing this is to use the jig shown in the right-hand detail of the drawing. It consists of a wooden base on which two parallel cleats are nailed to take the bottle or jug, an adjustable stop clamped to the base, and a three-cornered file held as indicated by means of two iron or brass strips. The bottle is then rotated against the file to score a straight line on its surface, which is necessary to break the glass evenly. Another jig, shown in the left-hand detail, consists of a porcelain cleat receptacle screwed to a wooden base and provided with a heater element. Or, if you wish, a flatiron or toaster plug can be screwed into the receptacle, to serve the same purpose as the heater element. Two radio binding posts are mounted on the baseboard. The wiring should be carefully followed, and a plug provided for attachment to a convenient wall socket. The resistance wire may be either ordinary soft iron, nichrome, chromel, or any other kind, which can be heated to a dull red without melting or burning away too quickly, and the size may vary from No. 18 to 24. To find the proper length of the wire to use, attach one end of it to the binding posts while the current is off, taking care that the wire is not kinked. If the wire does not become red, it should be shortened, and if it assumes a bright yellow or white heat, a longer piece must be substituted. The proper length is indicated by a dull-red color. Pass the wire through holes drilled in a block of asbestos, as indicated by the dotted lines, and adjust the wire tightly around the bottle, directly over the scratch. Then turn on the current, and the glass will break evenly. In the absence of an asbestos block, you can substitute wood, provided the holes are lined with asbestos tubing. If the bottle is thin, the glass will fracture quickly. In the case of thick bottles, it may be necessary to fill the bottle with cold water up to the mark, before applying the current, or to submerge it in water up to the mark. The electric method is superior to that of burning a string saturated in alcohol or gasoline, as the wire heats a very small portion of the glass evenly all around, while a burning string develops more heat on certain portions than on others, which results in an uneven fracture. After the cutting has been successfully done, the sharp edge of the glass should be dulled with a file or emery wheel.

Swinging Woodbox Is Accessible on Both Sides



Hinged to the Baseboard, This Woodbox Keeps Out Cold Air When Open or Closed

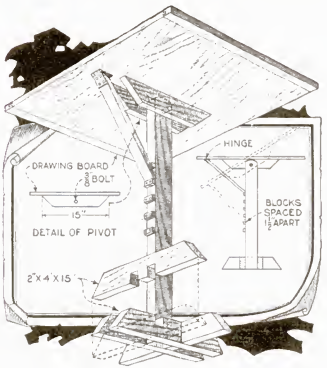
Placed in an opening cut in the wall, this woodbox is hinged to the baseboard and tips forward like a flour bin. The construction is clearly shown. The front and back of the box are slightly larger than the opening in the wall to act as stops when it is opened or closed. The depth of the box should be greater than the thickness of the wall, and the back so made that it completely closes the opening when the box is tipped forward. In this way, the box may remain either open or closed without admitting cold air into the room.—E. L. MacFarlane, Fredericton, N. B., Canada.

Cause and Prevention of Noises in Hot-Water Pipes

Noises in hot-water pipes are often caused by steam being generated in the boiler when the bulk of the water is not near the boiling point. In localities where hard water is used, one of the circulating pipes often becomes choked by lime deposits, causing the water to circulate more slowly through that part of the boiler, where it boils in spite of the fact that other parts will be much cooler. This often occurs in large houses where heavy fires are kept and the water is constantly drawn off in large quantities. Such a condition can be identified by the noise occurring when there is a good fire but the tank is not very hot. The remedy is to have the faulty pipe replaced. A similar kind of noise may be caused by a layer of fine scale or sandy deposit on the bottom plate of the boiler, and occurs soon after the fire has been lighted. This trouble is met with only in flat-bottomed boilers and can be remedied by having the boiler cleaned out. However, one of the most common causes of pipe noises is too strong a fire, and too little hot water drawn out. Then the water approaches the boiling point and causes the steam to escape noisily up the pipes. Drawing off the water and regulating the damper will stop these noises at once.—James T. Watkins, Astoria, N. Y.

Tilting Drawing Table Is Handy for Home Draftsmen

This tilting drawing board has two large cleats nailed to the underside which are pivoted to a sturdy leg of 2 by 4-in. stock. A number of small cleats are screwed onto the leg to provide rests for a prop hinged to the table top, so that the latter can be adjusted to various angles. The base consists of four lengths of 2 by 4-in. stock arranged as shown.—H. C. Thomas, Detroit, Mich.



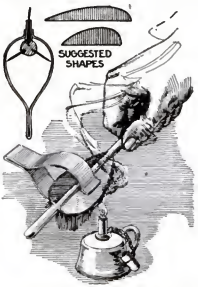
Anyone Can Make This Drawing Table Which Is Fitted with an Adjustable Tilting Top

Heat Removes Rosin from Knots Before Painting

Shellacking has been an accepted method for sealing knots before painting, but is not a positive preventive of bleeding. The following heat treatment has been found more effective: The flame of a blowtorch is played over the knot, taking care not to burn or scorch it, so that the rosin will be melted out, after which it is washed off with turpentine and linseed oil. This method actually removes most of the rosin, and a sealing coat of shellac is then unnecessary.

Jig Helps Form Arrow Feathers

Archers, making their own arrows, will find this little jig for shaping the feathers useful. It consists of two strips of brass or sheet metal, shaped to the contour of the feather and soldered to a spring-brass clip as indicated. The feather is cemented to the arrow shaft in the usual way, and the clip put over it. The projecting part of the feather is then burned off by holding it over a small flame. After removing the clip, the feather is rubbed between the fingers to remove the charred edge.—Harold I. Calkins, Lomita, Calif.



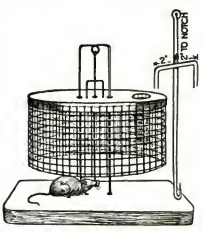
Heating Soil Around House Plants Induces Rapid Growth

It has been found that crop yields can be increased by heating the soil around the roots of growing plants with electricity. With little cost a similar method can be applied to the raising of house plants. Simply install a 10 or 15-watt electric lamp inside of an earthen flower pot, and set the plant into or over it, as shown. By burying a thermometer in the soil near the roots, the temperature can be read at any time. The length of time necessary to burn the lamp for proper heating can be found by trial. During winter, it may be advisable to keep the plant heated throughout the night, and perhaps part of the day. If you find that too much heat is being lost through the pot, wrap the outside surface with several layers of asbestos, or if this is not available, paper can be used.


Electric Lamp and Socket Installed in Lower Flowerpot Warms Soil around the Roots

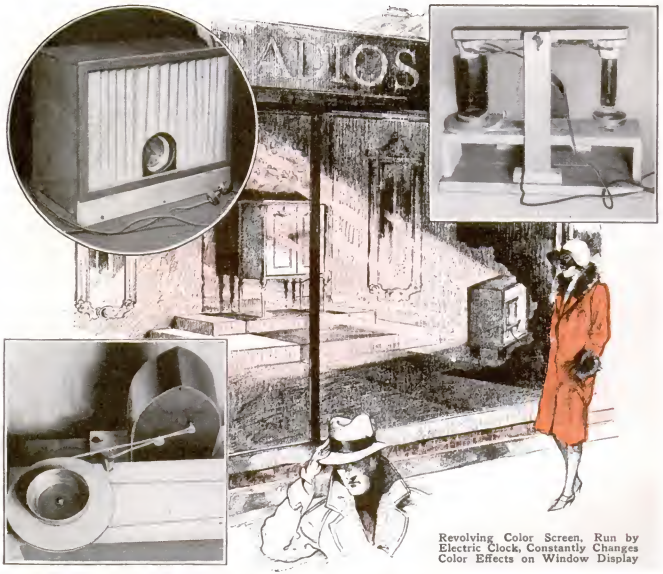
A "Sure Fire" Rodent Trap

Consisting of a ¼-in. wire-mesh cage, 13½ in. in diameter, tacked to a wooden top and mounted on a wooden base, this trap is easily made by anyone. The cage is hung 6 or 7 in. above the base on a trigger, which in turn is suspended from a heavy-wire support fastened to the base and extending up through the cage as shown. The construction of the trigger is shown in the detail. In use, the bait is stuck on the end of the trigger and the trap set. A pull on the bait drops the cage.



¶Silver knives and forks can be cleaned with water in which potatoes have been boiled.

Ever-Changing Colors for Window Display



Revolving Color Screen, Run by Electric Clock, Constantly Changes Color Effects on Window Display

Effectiveness of window displays can be greatly increased by using a color curtain which throws ever-changing colors on them. The curtain consists of two revolving cylinders of red, blue and yellow translucent material, each housing an electric lamp, and an electric clock to rotate the cylinders, the whole assembly being contained in a suitable box. The cylinders rotate at different speeds so that there is a constant change of almost all the colors of the spectrum. The cylinders are 2 in. in diameter and 5 in. long, made from four rectangular colored cellulose sheets placed side by side and overlapped about 3/16 in. The edges are fastened together by stapling or with collodion. There are two methods of using an electric clock to drive the cylinders. One is to remove the second hand and substitute a small pulley, and the other is to solder a binding-post nut to the starting button to form a pulley. In the former case, one of the wood pulleys should be about the same size as the clock pulley. If the starter button is the driving part, use a wood pulley of large diameter. Of the two remaining wood pulleys needed, one is twice the diameter of the other, the exact measurements being unimportant. Mount the two pulleys on a board with wood screws, the separation depending on the space in which they are to operate. On top of each pulley, fasten a small 2-in. can lid to receive the colored cylinders. With belts made from small cords, connect the pulleys and clock so that the cylinders will rotate slowly, either at 1 and 2 r.p.m., or ½ and 1 r.p.m., respectively. The exact manner of mounting the clock motor depends on the space available. Above the center of each cylinder, fasten, by means

of a crossarm bolted to an upright, two porcelain sockets to receive the lamps. It is essential that all moving parts work easily, and that the belts be neither too tight nor too loose. A pleated silk curtain is fitted over the open side of the box so that the colors will be slightly subdued. The clock draws so little power that it can be left running all the time, the color-curtain lights being turned on and off as desired. Of course, other motors can be employed to drive the cylinders, if the speed can be reduced sufficiently. The size of the lamps depends on the light desired and on the space to be covered.

Glass Trap Checks Cannibalism of Tropical Fish

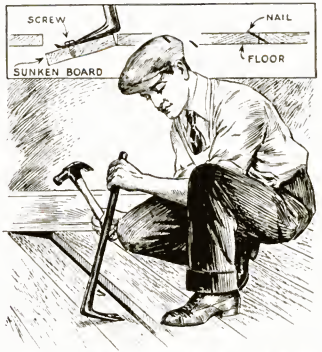
Tropical fish that bear their young alive often eat these, and it is therefore necessary to keep them separated. I did this by means of the illustrated trap. The wooden ends have three holes drilled in the center and are grooved along the edges to receive glass sides. Wire, threaded back and forth through the holes and drawn tight, holds the assembly together.



A space, equal to the thickness of a half-dollar, should be left between the lower edges of the sides. Suspend the trap, with the adult fish inside, from a stick laid across the top of the aquarium. The young, when born, fall through the opening at the bottom of the trap, which should be covered with a piece of screen to prevent the adult fish from jumping out.—K. F. Keith, Chicago.

Drying Canvas Work Gloves

Here is a simple, but quick and effective method of drying wet canvas gloves. Tie a string to the cuffs and stuff the gloves with wads of crumpled paper to allow free circulation of the air inside. Then tie them to a support so that they will swing freely in a breeze. In this way, the gloves will keep turning and will dry on both sides in a very short time.



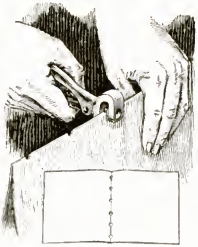
Sunken Floorboards Quickly Raised and Repaired with Pinch Bar and Woodscrew

Easy Method of Repairing Sunken Floorboards

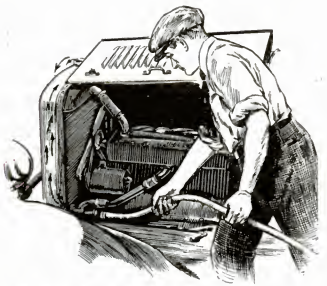
With the use of a pinch bar or a heavy claw hammer and a woodscrew, sunken floorboards can easily be repaired. The screw is driven into the board which is then pried up and secured to the floor by toeing nails into the edges.

Punching Holes in Large Sheets

When it is desired to bind large, single-folded sheets of paper with ribbon or cord, and the small hand punch is too limited for punching the holes, a simple trick will increase its range. Fold the sheets over in the center and take half cuts with the punch along the folded edge. When the sheets are unfolded you will have a round hole of the proper size, and exactly in the center.



¶An old auto frame with planks bolted to it makes a sturdy raft.



Flushing a Car Radiator with a Water Hose Insures Thorough Removal of Rust and Dirt

Better Method of Flushing Radiator

Before flushing out the water system of your car, use a good grade of commercial rust and dirt solvent. With this solution in the radiator, run the motor until the water is hot, and then drain the entire system. The rust and dirt, now in a more or less fluid state, can be quickly removed by flushing. To do this, remove the lower water connection from the bottom of the radiator and insert the hose as shown, taping the hose nozzle to the radiator connection, to prevent leakage and thereby get the full benefit of the water pressure.

Window Catch Closes Storm Door

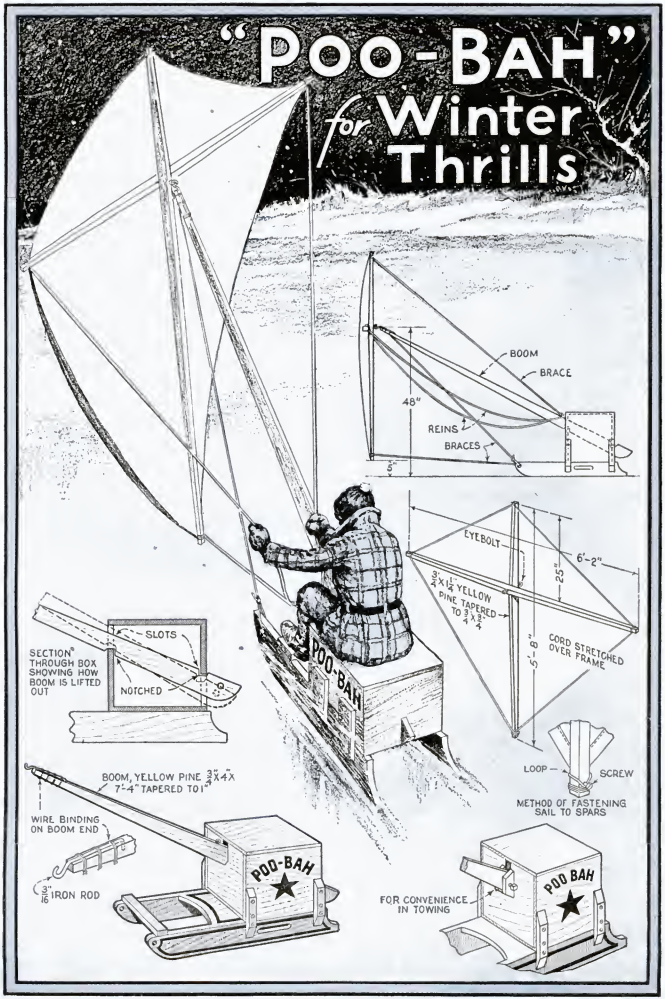
By using a window catch on a warped storm door, which does not close entirely, it can be fastened at night so that it really serves its purpose of keeping out the cold. The catch is installed at the point where the door will not close. Part of the catch is screwed to the edge of the door and the other to the door frame, as indicated.



"Poo-Bah"—a Winter Windjammer

In a stiff breeze, the wind-driven sled shown on the opposite page gives thrills of coasting, ice-boating and driving a spirited horse, the sail pulling the sled at the end of a long boom, and the driver manipulating it with a pair of reins. Greatest speed is attained in going with the wind, but a quartering wind will also drive it when the sail is pulled in toward port or starboard, as the case may demand. In slowing down or coming to a stop, the wind can be spilled from the sail by simply turning it parallel to the breeze. Steering is accomplished by the usual method of short sleds, that is, throwing one's weight to one side and dragging a foot, if necessary; manipulating the sail will also help turn in a wide sweep. Select a comparatively short sled for easy maneuvering, and fasten on it by means of cleats a box of the same width. In the center of front and rear, as shown, make slots, ⅞ in. by 5 in., to carry the boom, which is a piece of ¾ by 4-in. by 7 ft. yellow pine, tapering from 4 to 1 in. Notches are made as indicated to engage the slots in the box. Thus the weight of the sail holds the boom in position until it is lifted out. At the small end of the boom, a hook is fastened to support the sail. Make a kite-shaped sail, with two spars of ¾-in. yellow pine tapering from 1¼ to ¾ in. A light eyebolt holds them together where they cross. Bind the ends with soft wire and in each set a screw with the head extending about ¼ in. Stretch a cord over the ends of the spars, with a loop for each, cut your sail to fit with a 1-in. lap, baste it to the cord and then remove for stitching on a sewing machine. Thus the sail can be removed easily, the spars unbolted and the unit carried conveniently when not in use. Unbleached muslin will be satisfactory for the sail; two pieces, 1 by 2 yd. in size being sewed together and then cut to shape. By screwing two blocks to the sides of the forward boom slot, and putting a bolt through them and the unshipped boom, a good towing bar is made and the "Poo-Bah" can be hauled by a car to the frozen lake or pond.

¶Calcimine brushes easier if ½ pt. of liquid soap is added to each gallon.


"POO-BAH"
for Winter Thrills
BOOM
BRACE
48"
REINS
BRACES
5"
EYEBOLT
6'-2"
25"
3/4 X 1 1/2 YELLOW PINE TAPERED TO 3/4 X 1 1/4
5'-8"
CORD STRETCHED OVER FRAME
SLOTS
SECTION THROUGH BOX SHOWING HOW BOOM IS LIFTED OUT
NOTCHED
POO-BAH
LOOP
SCREW
METHOD OF FASTENING SAIL TO SPARS
BOOM, YELLOW PINE 3/4 X 4" 7'-4" TAPERED TO 1"
WIRE BINDING ON BOOM END
5/16" IRON ROD
POO-BAH
FOR CONVENIENCE IN TOWING
POO BAH



Toy Balloon Made of Cellophane Stays in Air Several Days and Travels Long Distances

Homemade Cellophane Balloon Travels Long Distances

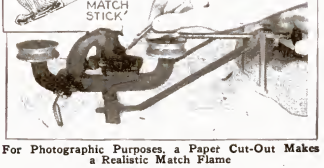
Here is a toy balloon that will remain in the air for many days and, with favorable winds, may travel very long distances. The advantage of this balloon is that it is made of transparent cellophane, which allows the sun's rays to pass through it without appreciably expanding the hydrogen gas with which it is filled. The cellophane is cut into gores, 3 in. wide and 18 in. long. One roll of cellophane will make a balloon about the size of a large water ball. In cementing the gores together, it is necessary to hold them on a rounded surface such as a large ball or round vase. Allow the gores to overlap about ⅛ in. and use collodion for cement. About 10 gores are required to make a sphere. A 1-in. length of rubber tubing is cemented in one gore for inflating. The apparatus to do this consists of a bottle containing about 1½ oz. of sulphuric acid, which is slowly poured into an equal amount of water, whereupon a few pieces of zinc are dropped into the bottle and the latter is closed with a cork fitted with a rubber tube, which leads to a second bottle containing lump quicklime. This removes all moisture from the hydrogen gas that is generated. A tube from the latter bottle connects with the balloon, which is flattened before filling with gas. When filled, tie or cement the tube so that the gas will not escape. The final operation consists in attaching a sheet of instructions, asking the finder to send notice of the landing of the balloon.

Trouble Shooting in Automobile Ignition Systems

Intermittent missing of a motor is often caused by poor contact between the carbon brush in the distributor cap and the spring on the rotor arm. If the brush is worn off even with, or below, the metal band that holds it in place, there will be a poor contact or none at all. This will cause the engine to fire intermittently, especially when traveling at normal speed. The best remedy is to provide a new distributor cap. If this cannot be done, remove the carbon brush and replace it with one made from an old motor or generator brush, allowing it to project about ⅛ in. beyond the metal. Scrape the points in the distributor cap with a sharp knife, removing only enough to produce a good contact for the spark. These points need not touch the rotor arm as the high-tension current will readily jump a slight gap. In some cases a small piece of brass or steel can be soldered to the rotor arm to reduce the size of the gap and consequently the resistance to the spark.

Imitation Match Flame for Use When Photographing

When photographing gasoline appliances, a western photographer made a paper cut-out representing a flame and attached it to a burnt match. This adds a realistic touch to the picture and does not cause a blurred spot like a real flame.

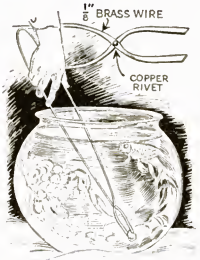


For Photographic Purposes, a Paper Cut-Out Makes a Realistic Match Flame

Staining Shingle Roofs With Used Motor Oil

After repairing the roof of my home, I decided to stain it with used motor oil which was cheaply obtained from near-by garages. As a black stain was desired, I mixed a quantity of powdered lampblack with the oil. The roof was gone over thoroughly with this mixture, using a paintbrush, which resulted in a satisfactory and economical job. As it is cheap, the oil may be put on thickly in one coat, or the roof may be given two or three coats, each being allowed to dry before applying the next. This oil paint is an effective protection against rain, as the oil soaks into the shingles and acts as a preservative. For staining new shingles, the oil and lampblack can be mixed in a barrel and the shingles simply dipped into the solution and then set away to dry before use.—C. Illingworth, Vancouver, Can.

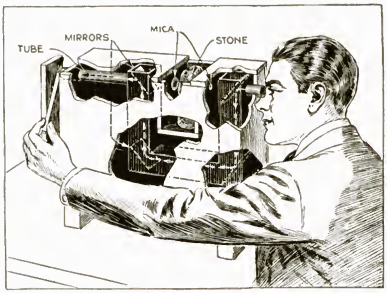
Aquarium Forceps Quickly Made from Brass Wire



A pair of wire forceps for use in removing or adjusting plants, stones, and other small objects, in your aquarium is easy to make. Bend a 30 or 40-in. length of ⅛-in. brass wire at the center to form a narrow "U" and hammer a small flat near each end, to allow drilling and the insertion of a copper rivet. Then flatten the ends of the wire to form the jaws.

Trick Box Gives Illusion of Looking through Solid Objects

By using hidden mirrors set at angles, this trick box gives the illusion of looking through an opaque object placed in a compartment which is open at the top.



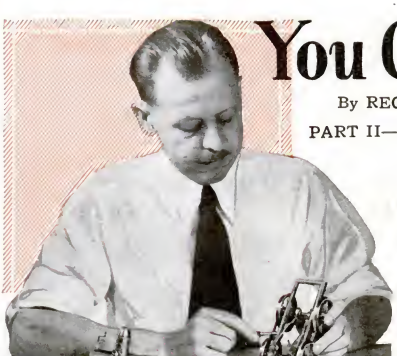
Built on the Principle of a Periscope, This Box Gives the Impression That Vision Penetrates Solid Objects

Holes are drilled in both sides of this compartment and are covered with mica to give the impression that the line of vision passes through them. Four mirrors, set in a built-in passage as indicated, direct the line of vision from one end of the box to the other, completely around the stone. Two tubes are inserted in the ends of the box, in line with the mica windows and also with the upper mirrors. In use, any object held at the end of the box will be visible through the tube at the other even though a stone or brick is placed in the center compartment.

Rubber Protector on Drill Chuck

When using a small automatic drill on a finished surface, it is a good idea to provide some method of preventing the chuck from marring the surface when it breaks through the work. This can be done by slipping one of the ordinary plumbers' fuller balls of the soft-rubber type, which are used in water faucets, over the drill and against the chuck as shown. This allows the drill to project far enough for ordinary work.





You Can Build

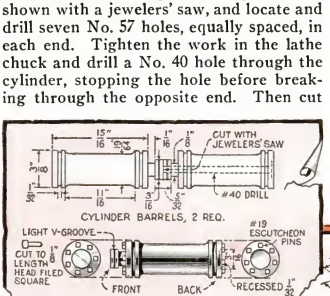
By REGINALD H. CLAUDIUS

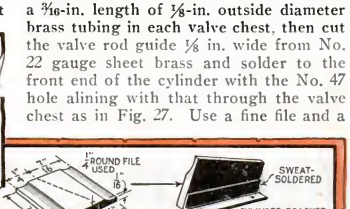
PART II—Cylinders, Pumps and Boiler

THE work of building the De Witt Clinton locomotive continues with the construction of the cylinders, the first step of which is detailed in Fig. 25. Turn both cylinder barrels from 3/8-in. round brass to the dimensions indicated in the top detail, then cut the parts along the line shown with a jewelers' saw, and locate and drill seven No. 57 holes, equally spaced, in each end. Tighten the work in the lathe chuck and drill a No. 40 hole through the cylinder, stopping the hole before breaking through the opposite end. Then cut No. 19 brass escutcheon pins to 1/8-in. length, file the heads square and drive into the cylinder heads.

The valve-chest base is next cut and filed from 1/8-in. brass, drilled and tapped as indicated, one right, one left, and is sweat-soldered to the cylinder barrel. The valve chest is next shaped and bored as indicated in Fig. 25 and sweat-soldered to the base on each cylinder, the tapped hole in the base and the steam-inlet hole in the chest being placed on the same side.

Fig. 26 shows the cylinder brackets, the valve-rod guides and the piston rods, and it should be remembered that the former must be made right and left. The upper left-hand detail of Fig. 26 is given only for the purpose of indicating the dimensions of the two parts, which must be cut separately. Assemble the brackets, right and left as shown, then sweat to the cylinders as in the lower left-hand detail. Drill a No. 42 hole for the exhaust pipe and No. 52 holes through the outside halves of the brackets. Solder a 3/16-in. length of 1/8-in. outside diameter brass tubing in each valve chest, then cut the valve rod guide 1/8 in. wide from No. 22 gauge sheet brass and solder to the front end of the cylinder with the No. 47 hole alining with that through the valve chest as in Fig. 27. Use a fine file and a





the "DE WITT CLINTON"



wire-brush wheel on a buffing spindle to remove excess solder.

The various parts which make up the cylinder crosshead-guide and valve-gear assembly on the left side of the frame, viewed from the front, are shown in Fig. 27. The cylinder assembly is bolted to the frame through the holes already drilled. All parts are duplicated, left and right, and are made of brass. To insure that the crosshead slides freely in the guide, it will perhaps be necessary to allow 1/64 in. for clearance between the projecting lugs. After the cylinder is bolted to the frame,

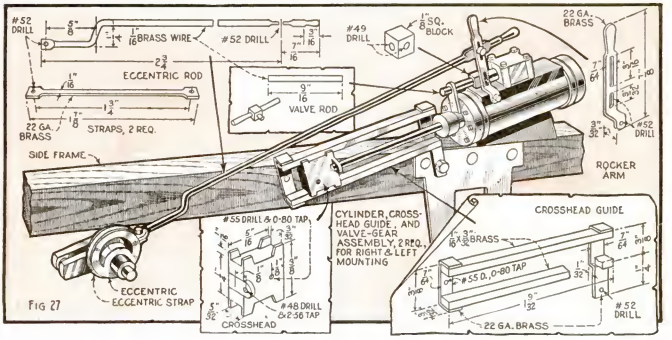
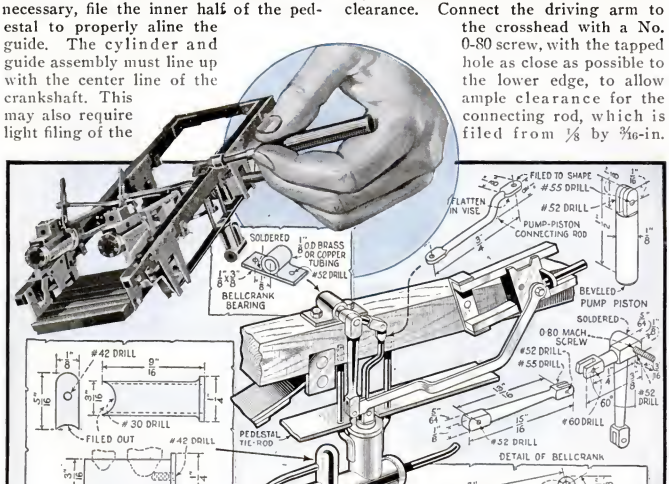


FIG 27

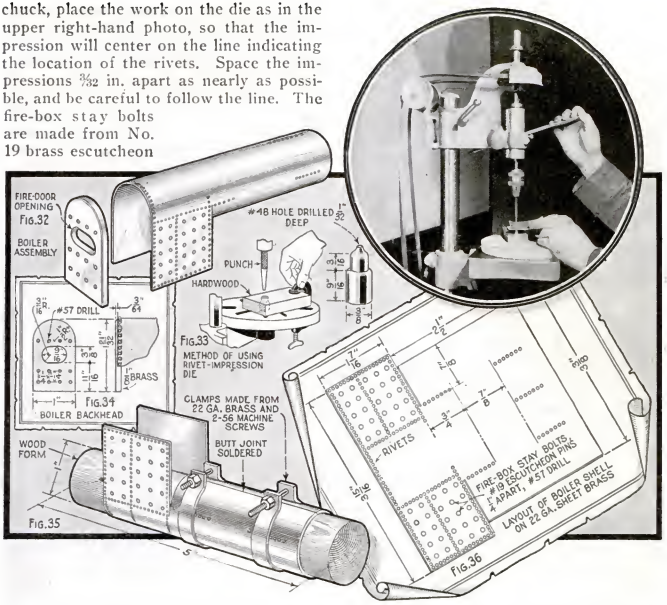
care must be taken, when assembling the crosshead guide, to get the parts properly alined, or the piston rod will bind. If necessary, file the inner half of the pedestal to properly aline the guide. The cylinder and guide assembly must line up with the center line of the crankshaft. This may also require light filing of the



parts. Figs. 28, 29 and 30 show the details and assembly of the mechanical water pump located on the left side of the frame, viewing the engine from the front. All parts are made of brass and are assembled as in Fig. 29. The pump cylinder is supported by the left pedestal tie-rod, the 1/16-in. wires passing through the rod and into the frame. The wires are soldered to the pump cylinder and to the tie-rod. The bellcrank bearing is centered 3/4 in. from the center of the crankshaft, and two No. 0-80 screws that hold the bearing are turned up in the wood. The long and short arms of the bellcrank are filed from 1/8-in. squares of brass and are soldered to a No. 0-80 screw as shown. After soldering, the head of the screw is filed off for clearance. Connect the driving arm to the crosshead with a No. 0-80 screw, with the tapped hole as close as possible to the lower edge, to allow ample clearance for the connecting rod, which is filed from 1/8 by 3/16-in. brass as in Fig. 31, the end that connects to the crank pin being held by means of a strap as shown. Make the eccentric rods and straps and connect to the valve gear as in Fig. 29.

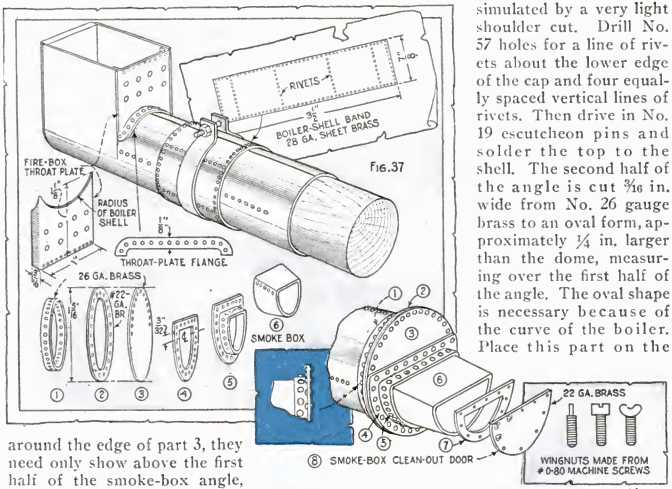
The boiler shell is first laid out on No. 22 gauge brass and is cut to the form shown in Fig. 36. Then the lines indicating the location of the rivets are laid out with a rule and sharp scriber, the rivet impressions centering approximately 3/32 in. from the edges. For punching the rivet marks turn a die from 3/8-in. steel rod as in Fig. 33, clamp a supporting block to the drill table and drill a 3/8-in. hole in the block. Insert the die, then grind the end of a small punch round and to such size that it will fit into the drilled end of the die. Tighten the punch in the drill

chuck, place the work on the die as in the upper right-hand photo, so that the impression will center on the line indicating the location of the rivets. Space the impressions 3/32 in. apart as nearly as possible, and be careful to follow the line. The fire-box stay bolts are made from No. 19 brass escutcheon



pins driven through No. 57 holes spaced on ¼-in. squares, as indicated in Fig. 36. Cut off the pins and rivet the ends. Make the boiler backhead from ⅛-in. flat brass to the dimensions of Fig. 34, rivet the indicated number of No. 19 escutcheon pins through No. 57 holes, and round one edge of the backhead by light filing. Turn a 5-in. length of hardwood to 1-in. diameter, as a form for shaping the boiler shell as indicated in Fig. 35, using two clamps made as shown. In doing this, make sure that the wood form is not less than 1 in. in diameter throughout its length; 1/64 in. over is permissible. Trim the joining ends of the shell to a close-fitting butt joint, flow on solder, remove the clamps and slip out the form. Then set the backhead in place as in Fig. 32, allowing it to project beyond the end of the shell 3/64 in. (See Fig. 34.) Hold it in place with clamps and flow solder into the joint from the inside of the fire box. The plates, which composed the original boiler shell, are best simulated by a band of thin sheet brass, made and applied as in the upper detail of Fig. 37. The rivets are the same size, and the band is placed on the boiler between the short horizontal rows of rivets in the shell. The band is trimmed to fit and the joint soldered parallel to that of the boiler.

The throat plate and throat-plate flange are cut from No. 22 gauge brass and soldered in the position shown. These parts must be trimmed and filed to fit. File the end of the boiler shell square across, and bring the length to $3\frac{15}{16}$ in., then cut a band ⅛ in. wide from No. 26 gauge brass, punch rivets along a center line and solder this around the end of the shell, the edges flush. Part 2, of Fig. 37, is cut ⅛ in. wide in the form of a ring and soldered to part 1, then the boiler end, part 3, is soldered to part 2. Though the rivets are indicated



simulated by a very light shoulder cut. Drill No. 57 holes for a line of rivets about the lower edge of the cap and four equally spaced vertical lines of rivets. Then drive in No. 19 escutcheon pins and solder the top to the shell. The second half of the angle is cut 3/16 in. wide from No. 26 gauge brass to an oval form, approximately 1/4 in. larger than the dome, measuring over the first half of the angle. The oval shape is necessary because of the curve of the boiler. Place this part on the

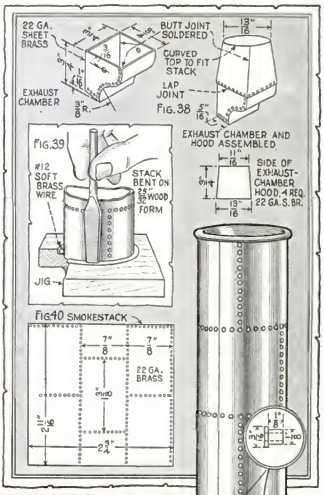
around the edge of part 3, they need only show above the first half of the smoke-box angle, part 4, as in the lower right-hand detail, which gives the complete assembly of parts 1 to 6. The top of the smoke box, part 6, is 5/16 in. long and slants 1/16 in. along the length, projecting 5/16 in. beyond part 5. Application of parts 7 and 8 complete the smoke-box assembly. Part 7 is soldered to part 6, while the clean-out door is held in place with wingnuts made from No. 0-80 screws as shown and turned up in tapped holes in part 7. When assembled, the rivets on parts 1, 2 and 3 should be in the position shown in the lower right-hand detail.

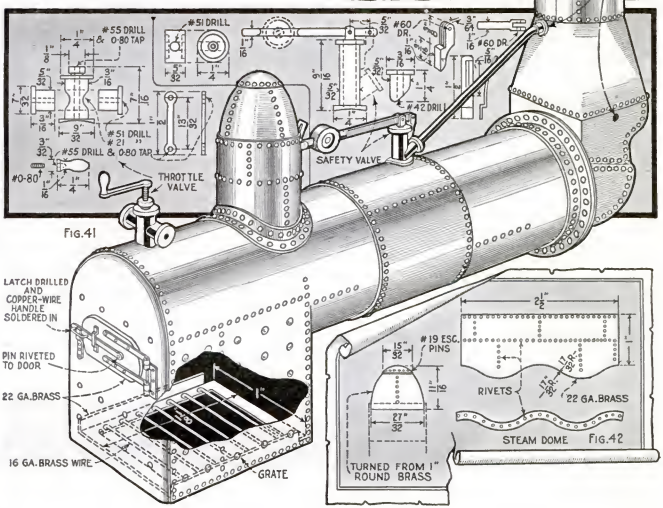
Next is the steam dome, shown in Fig. 42. The shell or body is first cut roughly to shape as in the upper detail, rivets being punched in the position indicated, and is then clamped about a wood form 2 7/32 in. in diameter and the joint soldered. Next, the first half of the angle, shown in the lower detail, is cut 1/8 in. wide from No. 26 gauge brass, and a row of rivets punched along a center line. The angle is then soldered to the curved end of the shell, and the whole is filed to fit the contour of the boiler. The top of the dome is turned from 1-in. diameter round brass to the form shown in Fig. 42, the top cap being boiler with the forward edge about 1/16 in. from that of the boiler-shell band. Set the dome over this, locate the parts in the proper position with relation to the boiler, hold firmly in position and flow solder into the joint between the halves of the angle and between the lower half and the boiler. Clean off all excess solder with a fine wire wheel.

Figs. 38, 39 and 40 show the exhaust chamber, exhaust-chamber hood and smokestack. The latter is laid out as in Fig. 40, and as the rivets are smaller than those in the boiler, the die is altered by filing the top flat, center drilling with a No. 55 drill to the same depth, and then turning the top end back to the original form. Alter the punch to suit, and then punch the rivets in the position indicated in Fig. 40. Bend around a hardwood form, turned to 2 5/32-in. diameter, trim the joint to a close fit and solder. Solder a length of No. 12 brass wire to the top end as in Fig. 39. Assemble the exhaust chamber and hood as in Fig. 38, from which it will be noted that the top of the hood is of circular form to fit the stack, while the lower end fits over the square top of the exhaust chamber. Soldering this is rather

difficult, and the easiest way to assemble the hood is to solder the four parts at the lower edge, which is a lap joint. Then file and bend the parts until the four butt joints fit properly to form the curved top, after which they are easily soldered. File an inside bevel on the lower end of the stack, and bevel the curved top of the hood until the stack fits snugly over it in a tight lap joint. Flow solder in the joint, then file the top of the stack square across and remove all excess solder with a wire wheel. Do not solder the completed stack to the smoke box until the throttle and safety valve are in place.

Next, turn the parts of the throttle valve from brass and fit together as shown. No solder is used on any of the parts. The No. 55 hole through the body of the valve is tapped clear through, and the two parts forming the flanges are turned to a tight fit in the No. 21 hole drilled transversely through the body. The stem is a No. 0-80 screw turned through one end of the handlebar. The head of the screw is then filed off. A short piece, cut from the threaded end of a No. 0-80 screw, is turned





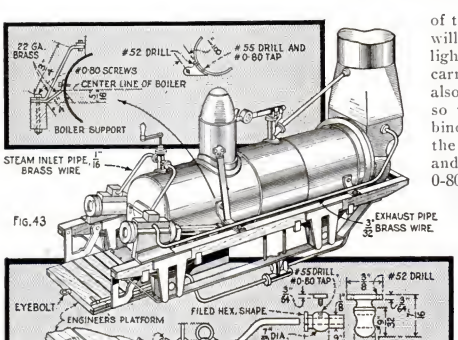
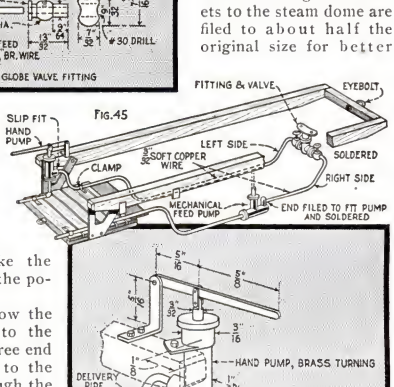


FIG. 43 FIG. 44 GLOBE VALVE FITTING

up in the brass handle, and this is tightened into the end of the handlebar. Round the lower face of the body flange to fit the curve of the boiler, drill a No. 52 hole, centering $\frac{9}{32}$ in. from the rear end of the boiler, place the throttle in position and turn up a No. 0-80 screw from the underside. Make the grates and fire door, and solder in the positions shown.

In making the safety valve, follow the dimensions in Fig. 41, soldering to the boiler as shown, the guide for the free end of the weight bar being soldered to the dome. Use fine wire for pins through the No. 60 drill hole in the plunger yoke and bracket, thus allowing the bar to rise and descend. The upper end of the exhaust pipe, leading from the valve to the stack, is fitted with a flange as detailed. Cut the pipe to approximate length from $\frac{3}{32}$-in. diameter brass wire, solder to the valve and also fit and solder the flange at the upper end. Fit the smokestack to the smoke box (some filing may be necessary) and, after soldering, fit and solder the upper end of the exhaust pipe, leading from the safety valve to the hood, in the position shown.

In assembling the boiler in the frame, follow Fig. 43 and the upper left-hand detail, which show approximate dimensions of the supporting brackets. It will doubtless be necessary to lightly file the crosshead lugs carrying the piston rods, and also to bend the eccentric rods so that these parts will not bind. The brackets supporting the boiler are cut $\frac{1}{8}$ in. wide and are held in place with No. 0-80 screws turned up in No. 55 holes drilled and tapped through the boiler shell and, at the lower ends, by means of a No. 0-80 screw through the frame as indicated. The heads of the screws holding the brackets to the steam dome are filed to about half the original size for better



appearance. The details and assembly of the globe-valve fitting, the eyebolts and the hand water pump, and also the steam inlet and exhaust pipes are shown in Figs. 43, 44, 45 and 46. These are comparatively simple. The only precaution necessary in fitting the globe valve to the boiler is to make sure that it is far enough forward to insure clearance for the cranks and

ends of the connecting rods. The handwheels of the globe valves consist simply of 5/32-in. disks, turned from brass and drilled and tapped for a short piece cut from the threaded end of a No. 0-80 screw, which is driven into the disk and soldered. The body of the valve proper is duplicated, and both parts are a drive fit in the No. 30 hole drilled transversely through the fitting. The complete fitting is fastened to the underside of the boiler, as in Fig. 45, with No. 0-80 screws, and is connected to the mechanical and hand water pumps with 3/32-in. brass wire in simulation of the original piping. Make and fit the eyebolts, front and rear, and place the hand pump on the left side of the frame to complete the engine.

It will be noted that certain dimensions on the boiler parts are oversize and will require trimming to fit. This has been indicated purposely to avoid waste of material due to the difficulty of cutting parts of the thin sheet metal to exact dimensions with shears. Where a wire is indicated as fitting a drilled hole, it is best to test the drill of the indicated size on a piece of waste stock, as it often happens that, owing to an error in grinding or the means of driving the drill, a given-size hole will turn out off size.

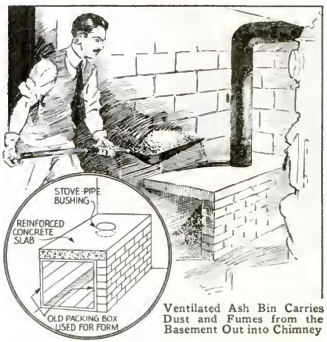
If you cannot purchase No. 0-80 screws, write to Popular Mechanics, and we will furnish them at cost. The De Witt Clinton contest will close Dec. 31, 1932, at 12:00 p. m.

Specimen Holder for Microscopes

Objects can be held under a microscope at the proper position with a fixture made as follows: Push two pin card holders into a small cork as shown, and insert a piece of clear cellophane in one and a piece of white paper in the other. With this arrangement, the specimen can be held at the proper position for the best illumination. The ring on the pin keeps the object from sliding off the cellophane.



This Ventilated Ash Receiver Keeps Your Basement Clean

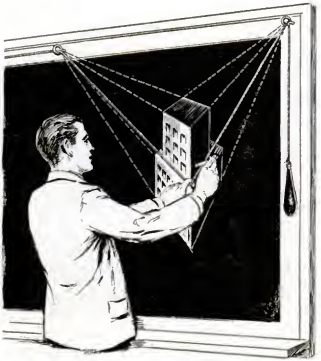


Ventilated Ash Bin Carries Dust and Fumes from the Basement Out into Chimney

Dust and fumes from hot ashes can easily be eliminated by the use of a ventilated ash bin in the furnace room. If made of concrete, an old box or crate can be used for a form, which is set in a corner so that the basement walls form two sides of the bin. Or, if desired, it can be built of brick or tile. After the wall has been built up about even with the top of the box, lengths of scrap metal or pipe are laid across the top for reinforcing, small holes being chipped in the wall to support the ends. A stovepipe is set in place in the top before the concrete is poured, 1-in. wood being used on the sides to keep the concrete from running off. After the concrete has set, the box form is burned out and additional lengths of stovepipe, one of which is fitted with a damper, are run to a near-by chimney. When putting ashes in the bin, the damper is left open until the dust and fumes have escaped.

Driving with Car Doors Locked

In large cities, a motorist is often held up when he stops for traffic lights. To prevent such an occurrence, both doors may be kept locked so they cannot be opened from the outside, although easily released from the inside. This precaution not only relieves the motorist's mind but assures him that the car is locked when he leaves it.



Length of Twine Passed through Screweyes Simplifies Drawing of Perspectives on Blackboard

Method of Drawing Perspective on Blackboard

To simplify drawing perspectives on blackboards, tie a small weight to one end of a string passed through two screweyes, located at the vanishing points near the top of the board as shown. In this way, it is only necessary to pull the string down and use it as a guide for drawing the lines which will always be at the correct angle.

Waste Trap for Bench Planer

This planer is set on a bench with open top, and a drawer is provided underneath to catch the shavings, saving unsightly piles of rubbish in the workshop. A box may be put into the drawer, which is easier to lift out and dump than the whole drawer.—H. Rossiter Snyder, Guilford, Connecticut.



Drawer under Lattice-Topped Bench Provides Receptacle for Catching Shavings from Planer

Distributor Breaker-Point Spring Repaired with Hairpin

If the spring that controls the breaker points in the distributor head of a car breaks while on the road, a repair, that will have enough tension to operate the points until you reach a garage, can be made with a length of stiff wire or a hairpin. Bend one end of the wire around the rotor-pivot post, letting it extend far enough to make contact at the binding post where the broken spring is fastened. Then place a piece of heavy paper between the wire and the distributor housing for insulation. Should the breaker points become badly burned or pitted so that they will not produce a good spark, and no file is available to smooth them down, they can be cleaned sufficiently for the drive home by removing and rubbing them against a rock or other abrasive surface, such as the exhaust manifold.

Practical Substitute for Pulley



While experimenting with the mechanism working a furnace damper, I was in need of a small pulley. The smallest one obtainable was too large. I took the bell crank from an old carburetor and mounted it as shown. This worked nicely, with greater convenience in operation than a pulley. —F. W. Bentley, Jr., Missouri Valley, Ia.

Emergency Measure with Cigaret

As all popular brands are made to a length of 2¾ in., a cigaret can be used for measuring when there is no scale at hand. Any short but confusing distance can be measured quite accurately by marking off the cigaret lengths with a pencil.

¶Mice cannot damage binder canvases that are suspended from the rafters of a shed by means of two barrel hoops.

INEXPENSIVE

BUILT-IN TABLES *for* YOUR HOME

by Oscar Hansen

ALTHOUGH inexpensive, these built-in tables have beauty of design and construction and are of general utility in the average small home and apartment. Their exact shape and size must be largely determined by the wall space and the size of the room in which they are to be built, as well as by the fancy of the builder.



In the construction, the only material needed is ¾-in. five-ply veneer, ordinary stock molding, 1 in. wide, and a few 1-in. brass-plated iron portiere poles with fittings. Tables of various designs are shown, some of which have two or three shelves, but the method of building them is essentially the same in all cases. The top and shelves, which may be rectangular or curved, are doweled to a 1-in. backboard which fits between them and is attached to the wall. Lengths of portiere tubing are fitted between the top and the shelves to support them at the front edge. The best way of doing this is to screw wooden plugs into the surfaces and slip the tubing over the plugs, as shown in Fig. 3. Tables may be supported by one or more legs or they can be suspended from the ceiling, tubing and curtain-rod fittings being used for this purpose. If the tables are to be attached to a frame wall, it is a simple matter to drive long wood screws through the back and into the studs behind the plaster, the position of the studs, which are usually 16 in. apart from center to center, being determined





by sounding. If, on the other hand, tables are to be attached to a wall of brick or tile, expansion bolts are needed.

The variety of purposes to which tables lend themselves can be seen from the photos, Fig. 1 showing a suspended writing table, and Fig. 6 a dressing table, built along the same lines as already described, but refined by the addition of a mirror top and back, the molding on the edge of the table holding the mirror in place securely.

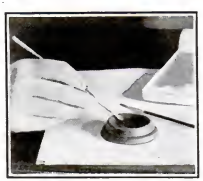
For finish, tables may be stained and varnished to match the woodwork of the room, and, in this case, the veneer should also be the same kind of wood as the room trimmings.

Another method of finishing is by application of paint, lacquer or quick-drying enamel. In the latter case, a combination of two complementary colors will give a pleasing two-tone effect.

Simple Method of Making Tiny Gears for Models

When making model gears of 1/16-in. diameter or less, the task of cutting and spacing the teeth can be simplified by using celluloid and proceeding as follows: First scribe two circles on the celluloid, one of 1-in. diameter and the other to represent the hub, both from the same center, of course. Next, draw lines from the edge of the smaller circle to the larger circle, dividing it into equal parts to represent the centers of the teeth, and finally scribe a third circle to represent the outer edge of the finished gear. After a hole has been drilled through the center, determine the thickness of the teeth and cut away the triangular portions between them. The result will be a tiny hub with long teeth, which are cut off to proper size and smoothed down with sandpaper. This gives you the finished part ready to color and attach to the model.

Rubber Cup for Mixing Water Colors



Small rubber cups such as are used under casters on furniture make good containers for mixing water colors. They hold just the right amount of water for this purpose, are easily cleaned, are unbreakable and cost very little.

Paints for Steam Radiators

When used on radiators, paint should be elastic enough to expand and contract with the metal. First remove the old paint and thoroughly clean the radiators. Then apply a priming coat consisting of heavy-paste white lead, 100 lb., linseed oil, 2 gal., pure turpentine, 1 gal., drier, 1 pt., or smaller quantities in the same proportions. This coating should be brushed out and allowed to dry thoroughly before applying a second coat of paint consisting of heavy-paste white lead, 100 lb., flatting oil, 2 gal., turpentine, 2 gal., drier, 1 pt. Allow this coat to dry and apply a third coat mixed as follows: Heavy-paste white lead, 100 lb., pure turpentine, 2 gal., floor varnish, 1 pt., drier, ½ pt. For a glossy finish, use the following: Heavy-paste white lead, 100 lb., flatting oil, 1½ gal., floor varnish, ¾ gal. Do not apply any coat sooner than 24 hours after the previous one, and allow the last coat to dry thoroughly before letting steam into the radiator.

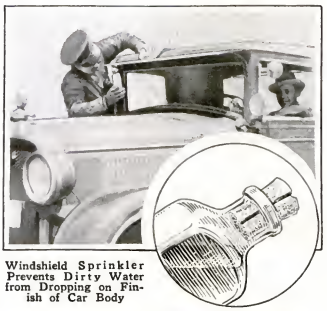
Rubber Band Holds Rope on Bail



When using a pail to which a rope must be attached, a rubber band from an old inner tube wrapped around the bail will hold the rope securely in the center and prevent the pail from tipping. Wrap the band around the handle and loop the ends into each other until it is firmly stretched. Then pull up on the ends, slip the end of the rope through them and tie the band to the handle.

Mercury Removes Bullet from Gun

When a bullet becomes lodged in a gun barrel, it can be removed with mercury without any harm to the rifling of the gun. Place the gun in an upright position and pour a teaspoonful of mercury into the muzzle. After a few hours, the mercury will dissolve enough of the bullet to allow it to fall out at the breech.—Warren N. Crane, Brooklyn, N. Y.



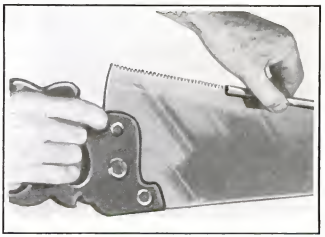
Windshield Sprinkler Prevents Dirty Water from Dropping on Finish of Car Body

Hand Sprinkler Cleans Windshield

By filling a bottle with a solution consisting of soapy water and a little vinegar, and fitting it with a grooved cork, as shown in the detail, you can make a sprinkler for cleaning windshields. This will be especially useful to oil-station attendants, as a few "flicks" of the bottle will wet the windshield, which, when wiped and rubbed with a cloth, will be clean and sparkling. The use of the sprinkler also prevents spots of dirty water from dropping on the body finish.

Curtain Rod Protects Saw Teeth

A cheap brass curtain rod of the kind that has a slit along one side can be used as a guard for the teeth of a handsaw when carried in a tool kit. The slit is widened to slip over the saw while the set of the teeth keeps it from coming off. The guard is quickly put on or removed.



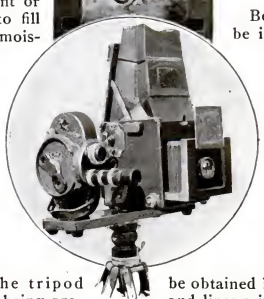
Old Brass Curtain Rod Spread at the Seam Provides Guard for Teeth on Saw

Shooting Movies and Stills at the Same Time









It is a comparatively easy matter to take movies and stills at the same time by mounting both cameras on a single wooden base. Plywood is the best to use for the base, as it is strong and will not warp when properly coated with paint or spar varnish. Be sure to fill the edges to prevent any moisture from getting under the veneer. A base, 4 by 14 in. in size, is satisfactory for this purpose. The best method of attaching the cameras is to drill holes through the base, and then drive thumbscrews into the tapped tripod holes in the cameras. A hole is also drilled through the center of the board to receive the tripod screw, a nut and washer being provided on the end of this screw to hold the camera base on the tripod securely. Or, if you desire, a hole can be drilled through the base in line with the tapped tripod-screw hole in one of the cameras, and the screw driven home instead of a thumbscrew. The latter method, however, holds the base off center resulting in poor balance. The photos show how both the movie and the still cameras mounted on the base can be used in the hands of the operator, or on a tripod, while examples of the work taken simultaneously are shown in the central and upper right-hand photos.

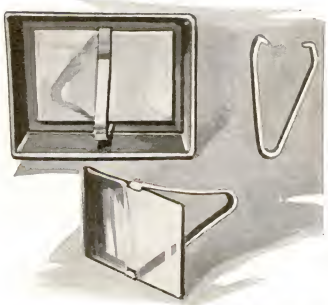
Producing Marble Effects with Paint

Beautiful marble effects can be imitated with paint as follows: For white marble, the first coat, or background, consists of a mixture of heavy-paste white lead, 100 lb., linseed oil, 1½ gal., drier, 1 pt., turpentine, 1½ gal., lampblack, ¼ oz., and French ocher, ¼ oz., or smaller quantities of like proportions. Before this has set, an inner veining effect of light gray may be obtained by blending in a few spots and lines with a mixture composed of lampblack, white lead and thinner. This should be allowed to dry before painting in veins of irregular shape and width with a mixture of lampblack thinned with turpentine, to which is added enough varnish to form a good bond. To help produce a more natural effect, apply a few lines of rust color by using burnt sienna. When the latter has dried, apply a coat of var-

nish, thinned with turpentine, and allow it to harden, after which a coat of pure varnish is put on. This coat is rubbed down with water and fine pumice, and the surface washed and rubbed with rottenstone and oil to give it the luster of polished marble. Two or more coats of thin varnish will give a glossy finish. For a black-marble effect, a coat consisting of heavy-paste white lead, 100 lb., linseed oil, 1¼ gal., lampblack, ¼ lb., drier, 1 pt., and turpentine, 1½ gal., is applied and allowed to dry. Then a coating of extra-fine lampblack, thinned with pure turpentine, with a varnish binder, is applied. While this is still tacky, paint in a few irregular veins with a thin mixture of lampblack, a little white lead and turpentine. White lead, thinned with equal parts of varnish and turpentine, may be used for the veining.

Spring Tongs for Handling New Photo Plates

As the new panchromatic photo plates must be handled in total darkness, it is a good idea to have a pair of tongs for grasping them. These can be made from a piece of spring brass or clock spring bent to the shape shown. The tongs may be left on the plates while the latter are being developed so that there will be no need of touching them with the fingers.



Spring Tongs Eliminate Necessity of Touching Panchromatic Photo Plates While Developing

¶Brass can be cleaned with a mixture of salt and vinegar, and rubbing it with olive oil will add a durable finish.



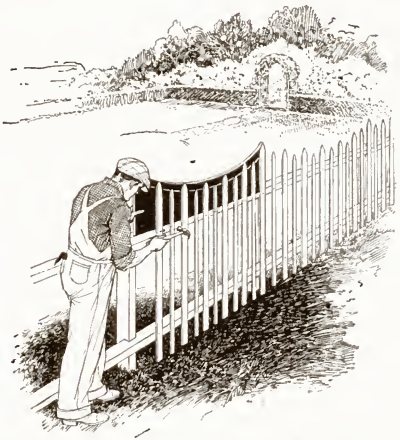
Box Fitted with Wheels and Handles Provides Safe Means for Moving and Storing Windows

Storm Windows Are Safely Stored in Wheeled Box

Storm windows placed in this wheeled box are easily moved to a basement or shed and stored without risk of damage. If possible, get a box that is large enough to hold all the windows, making partitions in it if desired. Attach wheels, handles and legs as shown.—John E. Bostow, Max, North Dakota.

Paper Keeps Powder in Flash Gun When Wind Blows

Have you ever tried to take a flashlight photo with an open-pan flash gun when the wind is blowing the powder out as fast as you pour it into the pan? Here is a simple trick to prevent this trouble. Load the gun in a sheltered place and wrap a single layer of light tissue paper over the powder-filled pan, twisting the ends of the paper loosely together beneath the gun. When firing, hold the gun to one side, as small pieces of burning tissue sometimes fall down. I have used this method for a number of years, and it has never failed. —K. F. Keith, New Orleans, La.



Curvature Cut in Length of Wallboard Provides Template for Making Uniform Picket Fence

Template Helps in Building Uniform Picket Fence

When building a picket fence, a piece of wallboard with one edge cut to the curvature of the fence top between adjacent posts, makes a good template for getting a uniform sweep of the fence. The template is nailed to the edge of a suitable length of 2 by 4-in. stock and placed on the top rail of the fence as shown. If the fence is to be made of only two different lengths of pickets, a guide line for the lower row can be marked on the template with a heavy pencil.

Purity of Water Tested with Sugar

When in doubt as to the purity of water, the following simple test will determine whether or not it is suitable for drinking purposes: Fill a glass tumbler with the suspected water, and add ½ teaspoonful of granulated sugar. Then set the glass in a place where it will be exposed to the sun for about three days. If the water has a dangerous content of germs they will thrive on the sugar and the water will turn a "milky" color, while, if the water is pure, it will remain clear.

Yam Provides Substitute for Green Plants and Flowers

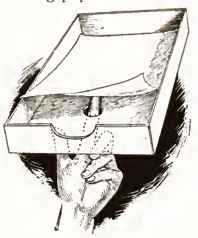
When placed in water, an ordinary sweet potato will grow and produce flowers and graceful vines that make a beautiful indoor decoration for use in the winter months. The most effective container for this purpose is a clear glass bowl with a narrow neck. This holds the potato upright and allows the roots to grow and mass in a fantastic design. The yam flower is fragile and of a rose-colored hue and has a close resemblance to a tropical bloom.

Producing Scenic Backgrounds on Film Headings

Amateur photographers can produce scenic backgrounds on movie-film headings by photographing the scenery through a piece of glass upon which the lettering has been printed. When developed, the film will have the lettering in the foreground and the scenery in the background. Ink for writing on glass can be made by mixing powdered India ink, 1 part, and sodium silicate, 2 parts.

Hole in Bottom of Office Tray Aids in Removing Papers

Difficulty is often experienced in removing papers from an office tray. It can easily be overcome, however, by drilling a 1-in. hole in the bottom of it, as shown. By poking a finger through this hole, the papers can be raised and lifted out with ease.



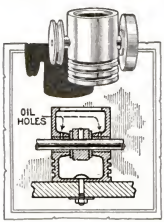
¶Walking sticks and umbrellas, set in a corner on a polished floor, usually have a tendency to slip, but this can be prevented by placing the ends in an ornamental bowl.

Alcohol Restores Original Luster of Shellac

When exposed to humid atmosphere, the alcohol content of shellac absorbs sufficient moisture to precipitate part of the dissolved gum. This condition is readily apparent by the milky color of the work. To overcome the trouble, moisten the work with a little alcohol brushed on with a camel's-hair brush in one direction only. The idea is simply to redissolve the shellac so that it becomes clear. Work gone over in this manner should be rubbed down with a fine grade of powdered pumicestone, or rottenstone and oil, using a soft felt pad.

Old Pistons Used as Shaft Bearings

Discarded auto pistons make inexpensive bearings for light shafting, when rigging up a home workshop. A hole is drilled in the top of the piston which is then bolted in position. Holes also may be drilled through the bushings for oiling. If the particular size of piston required is not available, it is a simple matter to bush the bearing. The drawing shows a bench grinder, having an old piston for the shaft bearing. A collar is set on the shaft between the bushings and washers added to take up end play.



Leaks in Metal Containers Repaired with Tinfoil

For an emergency repair of leaky metal containers, take a piece of tinfoil from a cigaret or tobacco package and twist it into a light roll. Insert it through the hole in the container and press both ends of the foil firmly against each side, which will plug up the hole until a permanent repair can be made.

When clipping photos to manuscripts, a small strip of celluloid bent double and placed under the clip protects the finish of the photos.



Attached to a Built-In Cupboard, This Step Provides Easy Means of Reaching Upper Shelves

Step Aids in Reaching Upper Shelves of High Cupboard

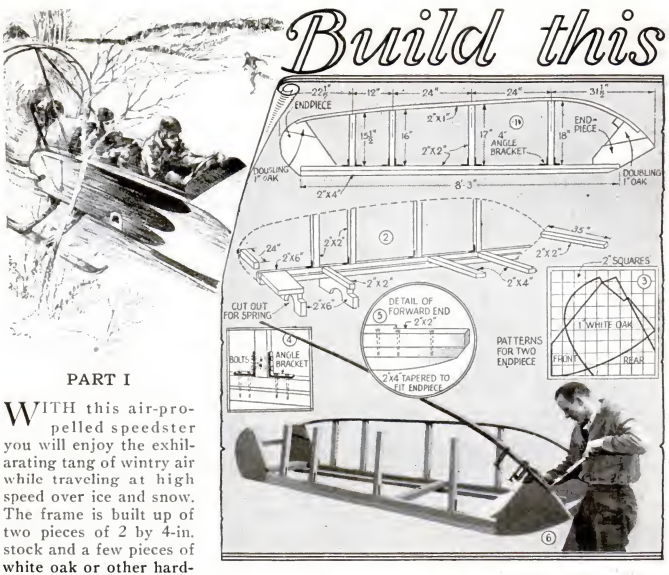
Permanently attached between the lower drawers by means of two iron brackets, a step will be useful in reaching the upper shelves of a tall cupboard. A 6-in. step does not project far enough to interfere with passage, nor will it prevent opening of the drawers.

Wedges for Tool Handles

The wooden parts of a spring-type clothespin make excellent wedges for tightening tool handles and hammer heads. Be sure to get a clothespin having hardwood parts, as these can readily be driven into place with little danger of breaking and splitting, which may happen if soft wood is used.



Build this



PART I

WITH this air-propelled speedster you will enjoy the exhilarating tang of wintry air while traveling at high speed over ice and snow. The frame is built up of two pieces of 2 by 4-in. stock and a few pieces of white oak or other hardwood, as shown in Fig. 1. Figs. 2 to 7 cover the constructional details. The curved strip of 1 by 2-in. ash, hickory or white oak, which extends across each side frame, can be fitted without steaming by making three saw cuts equally spaced in a distance of about 2 ft. from one end. Clamps should be used to hold the approximate curve, as shown in Fig. 6, while you screw the strip into position. Fig. 7 shows the finished framework ready for the motor installation.

The motor used is a two-cylinder motorcycle engine. The makes of these differ, of course, in respect to minor fittings, but the basic construction of all is quite similar so that, with few changes, you can follow the motor mount illustrated. To keep the center of gravity as low as possible, a chain drive is used, working from the motor to the revamped motorcycle transmission case with a 3:1 ratio on the sprockets. Thus, with the average motor turning from 3,600 to 4,000 r.p.m. at full speed, you will get good efficiency from the 1,200 to 1,300 r.p.m. on the propeller. The motor is mounted first, as shown in Fig. 8. Notice that two triangular iron mounts are fitted to the crankcase, taking advantage of the hole fittings provided for hanging the motor in the motorcycle frame. One of these braces will be shorter than the other for balance. Two other braces, fitting from the tops of the cylinders to either side of the frame, are necessary, as can be seen in Fig. 12. The metal stock in both cases should be 3/16 by 1⅛-in. steel.

The transmission case will require a few minor changes. Knock the case down, retaining only the shell, the main shaft and the two bearings and grease retainers fitting the shaft. The old shaft is not used, but you must have a machine shop make a new shaft, as shown in Fig. 9, the central portion of which duplicates the central portion of the discarded shaft. The new shaft will be longer so that it will take

Ice Speedster



a large sprocket. Fig. 10 gives a good idea how the case is reassembled. Notice that one large gear containing the roller bearing has been retained, but, as a whole, the unit is now simply a shell with the new shaft incased inside and running on the one ball race and the one thrust bearing, which composed the original fittings. A 48-tooth motorcycle sprocket is fitted to the end of the shaft having the smallest diameter. As the hole in this sprocket is somewhat larger than the shaft, it will be necessary to fit a new opening. This can be easily done by taking two of the small gears that came out of the transmission case and having one welded on either side of the sprocket. Both ends of the shaft are milled for a key, and nuts with S.A.E. threads are required. With the large sprocket properly keyed and cottered to the end of the shaft, the transmission case can be mounted in place as indicated in Fig. 11, angle iron being used for bracing. Convenient bolt holes on the case make the fitting quite simple. The short but important brace, which extends directly across the case and fastens to the two long supports, should be made from ¼ by 1-in. stock to obtain sufficient rigidity. One essential thing must be borne in mind throughout the fitting of the motor and case, viz., that the motor is not mounted perfectly plumb, but sits at a 2° angle, the top of the motor and the top of the case being inclined that much toward the rear. This slight angle gives the propeller a slight lifting power necessary to offset the weight of the motor at the extreme rear.

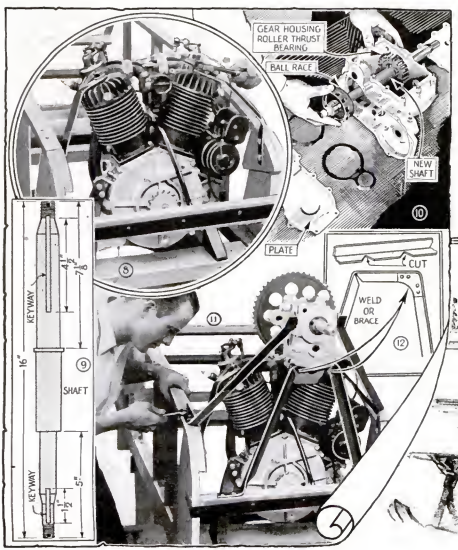
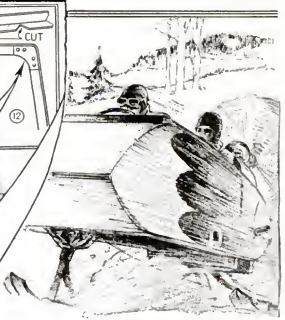
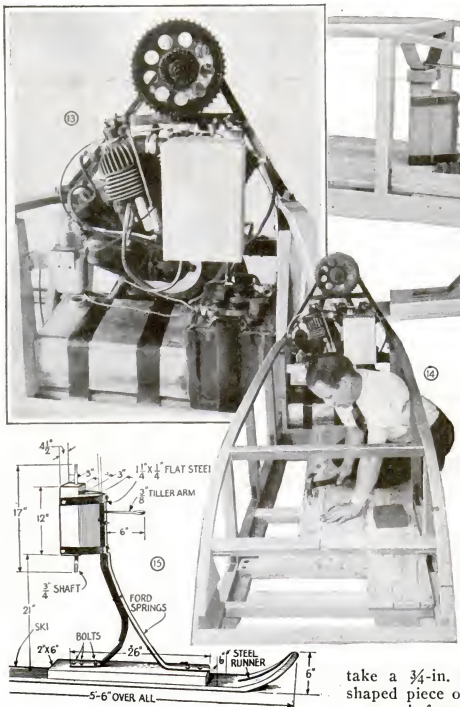


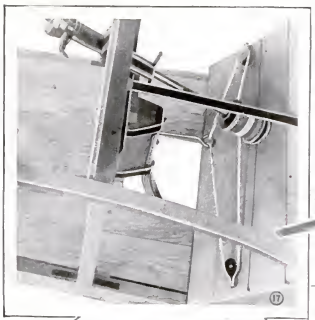
Fig. 13 shows the other



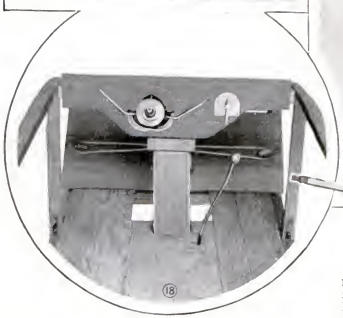


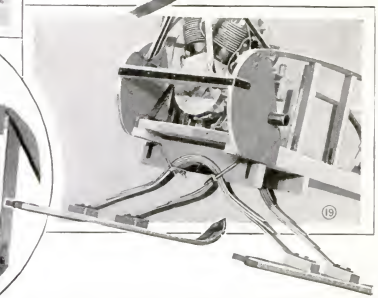
side of the motor, with various fittings in place. The 4-gal. gas tank is held by metal straps to suitable crossbars screwed to the framework, and a storage battery is likewise fitted. Gas feed is provided by an "autopulse" which pumps the fuel to the carburetor. A 1-gal. paint can serves for an oil tank and is strapped to the seat back, which is to go on later. Lengths of galvanized-iron pipe connect the two exhaust ports to a central pipe, which is carried out through a hole drilled in the frame endpiece. Ignition and gas controls are carried up alongside the frame to the forward end of the craft.

So much for the motor arrangement. The next thing to do is to put in the flooring, which consists of 4½-in. strips of wood, cut to fit and nailed in place as shown in Fig. 14. A square opening should be left at the forward end to allow for the fitting of the steering column. Obviously, the steering control must be of sturdy construction, good spring action and simplicity. These essentials are incorporated into the stem shown in Fig. 15. The main block is of white oak drilled lengthwise to take a ¾-in. steel shaft. The wedge-shaped piece of oak, which supports the runner, is fastened to the main block with two heavy flat-iron straps, that also serve to hold the springs in place The tiller arm, of ⅜-in. iron rod, is fitted through the wedge-shaped block and is held in place with a countersunk nut. The runner itself is a straight-grained length of 6 by 1-in. white ash, shaped to a suitable ski pattern and bent up about 6 in. at the forward end. It will be necessary to steam and soak the piece in hot water for some time in order to make this bend possible. A 26-in. length of 2 by 6-in. stock is fitted over the runner to take the spring bolts. For plain snow travel, the ski itself is sufficient, but if the speedster is to be used on ice, both the front and rear









runners must be fitted with ½-in. square or round iron stock, filed down to a sharp edge. This is fitted the full length of the ski, being held in place with countersunk screws. While the job of filing these runners presents somewhat of a hard task, it should not be slighted, as safe control from sidedrift on smooth ice is impossible without the biting edge of the metal strips. Fig. 16 shows the forward runner fitted in place. The steel rod fits through a hole drilled in the flooring, the unit riding on a large washer. A leaf from a Ford rear spring holds the block at the top to the frame, while a longitudinal brace extends from the shaft end to the brace immediately behind the forward endpieces. Steering is accomplished by the simple straight tiller arrangement in Fig. 17, which shows a top view. Flexible hemp-covered wire, 5/16 in. thick, is used in connection with a drum steering device fashioned from an old Ford steering wheel. It is fitted through the dashboard which should be previously cut and attached to the frame. The dash may be of almost any shape to accommodate the particular style of steering post and instrument controls selected, but it should stop ⅜ in. short of the side of the frame on either side, as shown in Fig. 18, to allow space for the fitting of the coaming strips which are to go on later.

The rear runners are 5 ft. long by 6 in. wide and parallel to the center line of the craft, being held 46 in. apart (inside measurement) by two Ford rear springs, as shown in Fig. 19. A central bolt and long U-bolts serve to hold each set of springs to the 2 by 6-in. frame members. Short 2 by 4-in. blocks are fitted to the skis to take the ends of the springs, which are rolled flat and drilled to take the required bolts. Propeller construction and other details will be described in the March issue.



Adjustable Mirror Is Handy for Shaving or Useful on Ladies' Dressing Table

Double Mirror for Use in Shaving

Two mirrors hinged together serve the purpose of a three-piece mirror, often used for shaving, to show both sides of the face as well as the front. Remove the frame from one edge of each mirror and then hinge the top and bottom pieces of both together as shown. If the hinges work fairly hard, the mirrors can be adjusted and hung on a wall.—A. H. Waychoff, Phoenix, Ariz.

Phonograph Aids in Striping Small Circular Articles

Having a number of flowerpots to stripe for a decorative display, a window trimmer used a phonograph to rotate them while the paintbrush was held against the outer surface. By using a yardstick for a guide and a steady rest, it was an easy matter to make neat and accurate stripes around the pots.

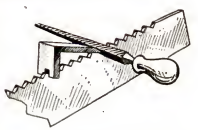


Stripes Quickly Painted on Small Circular Articles by Rotating Them with a Phonograph

Ice-Boat Runners from Steel Fence Posts and Old Skis

Ice-boat runners can be made from old skis and T-shaped steel fence posts. Cut the posts to 3-ft. lengths and bend one end slightly upward, to fit the ski, which should be cut down to the same length as the runner. As the posts are perforated, they are easily bolted to the skis. Drill holes through the skis about every 6 or 8 in., staggering the holes to avoid weakening the wood. Finish the job by grinding the edge of the runners in a manner similar to that of skate sharpening, straight-edge or hollow-ground. If old skis are not available, pine boards may be bent to the desired shape by steaming or soaking them in hot water and then placing them in a form until dry. Keep the runners sharp by occasionally touching them up with a file.

Spacer Helps in Saw Filing



Teeth can be accurately filed on an old saw by using the illustrated spacer. It is made from a piece of flat steel which is bent at right angles. One end is notched to fit over the teeth, while the other end is beveled to the proper angle to guide the file.—Chas. H. Willey, Concord, N. H.

Extension Spout on Can Prevents Waste of Gasoline

Motorists, who have run out of gasoline along the road, know the difficulty of pouring gasoline into the tank from the emergency cans furnished by the service stations. To overcome this trouble, solder a 4-in. length of copper tubing to the top of a 1-gal. can that can easily be stored in the car, and slip a section of rubber hose over the tubing. In this way, you will have an emergency can with a flexible spout that will enable you to pour gasoline into the tank without waste.



Ball-Bearing SHAPER *made from* SCRAP PARTS

by R.E.MYERS

HERE is a cheap shaper that any home-workshop owner can readily build from an old auto-generator shell and a few pieces of wood, including a piece of plywood to serve as a table. The spindle, Fig. 5, is the only machined part and this must be turned down to fit the ball bearings of the generator shell and also the shaper head to be used, the latter being obtainable from manufacturers of small shapers.



FIG. 1



FIG. 2

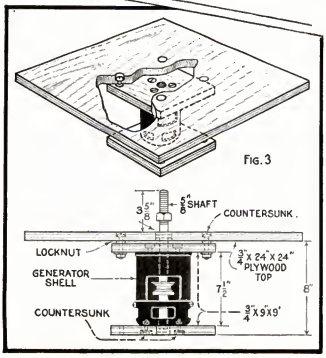
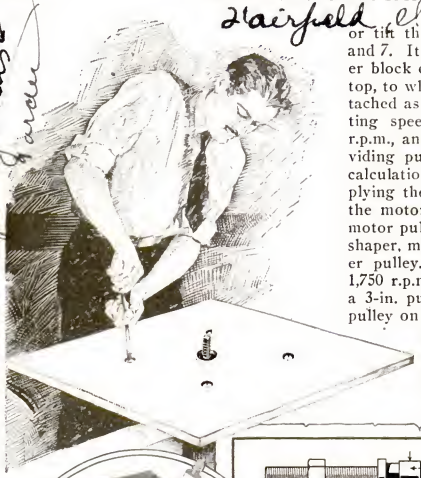


FIG. 3

After getting an old generator (the one shown was taken from a junked Ford), the armature and the brush holders are carefully removed, and a portion of the side is then cut out with a cold chisel to receive the belt, which is slipped over a small pulley fitting the spindle. Four ¼-in. holes, equally spaced, are drilled through the bottom, about ⅜ in. from the outside edge, to accommodate 1½-in. bolts, with which it is attached to a 9 by 9 by ¾-in. block. Another similar block is bolted to the top. Be sure to countersink the holes in these blocks to receive the bolt heads, and also drill holes for the spindle. It should be noticed that a boss is turned on the spindle to rest on the top generator bearing which holds the shaft, while a collar is securely attached to the shaft directly under the upper bearing, to prevent upward movement of the shaft, al-



or tilt the table, as indicated in Figs. 6 and 7. It is best to bolt or screw the lower block of the shaper to the workbench top, to which an electric motor is also attached as shown in Fig. 1. A good cutting speed ranges from 5,000 to 6,000 r.p.m., and this may be obtained by providing pulleys of the correct size. The calculation of pulley sizes is made by applying the following rule. The speed of the motor, multiplied by the size of the motor pulley, is equal to the speed of the shaper, multiplied by the size of the shaper pulley. Thus, if the motor speed is 1,750 r.p.m., which is quite common, and a 3-in. pulley is used on it, with a 1-in. pulley on the shaper spindle, the speed of the latter will be 5,250 r.p.m. The direction of the cutter with relation to the work is shown, in Fig. 2. In use with a wing-shaped cutter, it is possible to

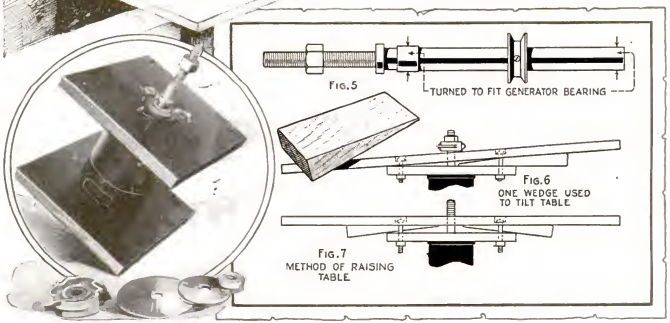


FIG. 5

FIG. 6
ONE WEDGE USED TO TILT TABLE

FIG. 7
METHOD OF RAISING TABLE

though this detail is not shown in the drawings. In this way the vertical play of the spindle will be reduced to a minimum. If the shaft is a drive fit in the inner race of the bearing, no collar is needed to prevent vertical play. A circular fence, a washer and a nut are provided to fit the spindle as shown in the lower details of the photo. If you have no lathe to turn down the shaft, the work can be done at any machine shop.

The plywood table is then fixed to the upper block with bolts that are long enough to allow the insertion of two wooden wedges, which are used to raise vary the shape of the molding by tilting the table with one wedge, as already mentioned. In doing this, however, a straight fence must be used to obtain an accurate, uniform cut, and the work must be run in a perfectly horizontal plane with relation to the cutter.

Water Shrinks Leather Belt

As an emergency measure against belt slippage soak it in a pail of water for 15 minutes. This causes it to shrink, but affords but temporary relief; so, use only when you have no belt dressing.

Scaffold Horses for Painters Are Adjustable

Painters and others who use scaffolds can work at any convenient height with these adjustable horses. Their construction is clearly shown in the photos, the top of each horse being made up of two pieces of 1-in. stock, spaced to allow a third piece of the same thickness to slide between them. The movable part of the horse consists of two vertical members, or legs, and a crosspiece, all three being of hardwood as they will be subjected to considerable strain. A row of staggered holes are drilled through the legs, to accommodate a heavy spike which holds them up at any desired height. It should also be noted that additional bracing for the legs is provided on the horse in the form of pockets, into which the legs slide, in order to prevent sideplay. A couple of these horses on the job will save much time in erecting scaffolding and the workers will find them a great convenience.



With a Couple of These Adjustable Horses, Scaffolding Can Be Quickly Raised to the Most Convenient Working Height

A Rubber Brush to Use in Acids

To make a brush for use in any kind of acid, take a 4 by 3-in. strip of inner tube and cut one end with a pair of scissors as shown. Roll this on a stick and bind it tightly with a rubber thong, slipping the acid-jar cover over the handle. To prevent the bottle from tipping over, serrate a circular piece of tin and shape it as shown to form a base for the bottle.



Strip of Inner Tube, Cut at One End, Makes Brush for Applying Acids

Helpful Hints for Printers

To avoid blurring a printed sheet, make a finger stall of sandpaper, and use it on the large finger of the left hand to remove the sheets from the press. In building up the tympan on a press for an envelope job, slip a piece of blotting paper under the draw sheet. In this case, a cut-out is unnecessary, as the soft pad formed by the blotting paper will let the folds of the envelope settle enough to make the impression equal. A little jewelers' wax rubbed into the corners of a rule job will seal them so that it will be impossible to detect the joint. If rubber bands are wrapped around the "grippers" when printing a perforated job, the sheet will not pull off with the form.



Brakes Hinged to Rear End of Runners Hold Sled on Hills While Horses Rest

Brakes for Heavily Loaded Sleds

When pulling a heavily loaded sled uphill, these brakes are effective in holding the load while the horses are resting. They are made from two pieces of heavy iron, 10 in. long, shaped as shown in the detail and hinged to the rear end of the runners, holes being tapped in the iron for machine screws with which they are fastened to the hinge. The brakes should be mounted so that the points extend below the runner in order to afford a good grip. When not needed, they are turned back over the runner.

Humidity in Incubator Maintained with Moistened Pads

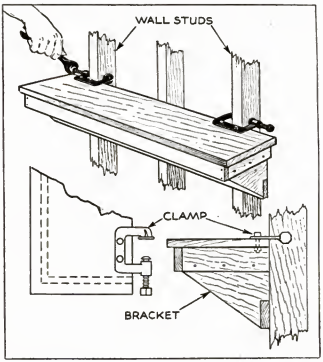
It is well known that a proper degree of humidity must be maintained in the egg chamber of an incubator. To do this, make several pads, 1 in. thick, by wrapping burlap around a shingle, 3 or 4 in. wide and from 6 to 12 in. long. Moisten these pads with warm water and hang them in the incubator, above the egg trays and under the radiator pipes, on hooks so that they can be taken out for remoistening when necessary. The pads have this advantage over the usual method of using wet sand or a pan of water set in the bottom of the incubator, that the moistened air is formed above the eggs. As humid air is heavier than the dry air, it moves toward the bottom and passes around the eggs, thus providing a continuous circulation of moist air, whereas with wet sand or a pan of water, it remains at the bottom and does not circulate.

Flatiron Helps Remove Wallpaper

When wallpaper cannot be easily removed by the usual methods, moisten it with a sponge soaked in water and run a hot flatiron over it. This generates steam and quickly softens the paste. Painting should never be done over paper except in the case of heavy embossed papers that are glued to the wall. It should be remembered, however, that some cities have a fire law prohibiting this practice.

This Portable Workbench Is Clamped to Wall Studs

For those doing work in the garage occasionally a portable bench that can be clamped to the studs is useful. Brackets are cut from 2-in. stock and nailed near the ends of the bench top. A recess is then formed at the lower end of each bracket to receive a length of 2 by 4-in. stock, which serves as a support against the studs, and heavy C-clamps are bolted to the bench top near the back to enable attachment.

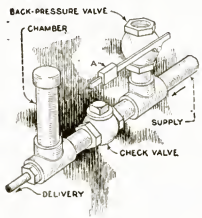


Portable Workbench for the Garage Fastened Rigidly to Wall Studs with Heavy C-Clamps

Hints for Operating High-Speed Bench Lathes

When stopping a high-speed bench lathe, the operator often checks the speed by laying his hand on the tightening wheel at the rear, putting a strain on the fine threads of the split chuck, which will in time enlarge them sufficiently to cause unnecessary wear and affect the accuracy of the lathe. If the hand is used to check the speed, it should be placed on the cone pulley. Pushing a tool against the cone while the lathe is in motion, will wear a groove in the cone. When cutting steel, it is good practice to place a piece of cloth or cardboard over the tool ways to catch the fine chips, so that they will not work in under the tool carriage and cause wear on the ways.

An Inexpensive Hydraulic Ram



Built from fittings easily obtainable, this hydraulic ram delivers a large quantity of water. The construction is clearly shown. No dimensions are given as the ram can be made in any desired size. In starting the ram, open the back-pressure valve sufficiently to allow the water to escape freely so there is force enough to lift and close the valve quickly. This will cause the water to open the check valve, allowing the excess pressure to escape into the air chamber and thence into the delivery pipe. If the back-pressure valve fails to open after a while, open it by pressing down the lever a few times, then by adjusting the weight A properly, and the ram should operate without further attention. It should be located 3 or 4 ft. below the source of the supply, which should be kept free of any debris that would tend to prevent the valve from closing.

Soap moistened with water and rubbed over a small piece of metal imbedded in the flesh will often help remove it.

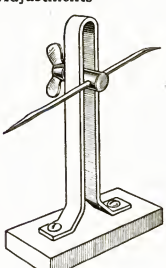


Glass Shield over Emery Wheel Allows Clear Vision without Getting Dust into the Eyes

Headlight Lens on Emery Wheel Protects Eyes

Mounted on the guard of an emery wheel by means of suitable brackets, the rim and a clear lens of an old auto headlight serve as a good dust shield for the eyes. The glass enables the operator to watch the work closely without fear of emery particles getting into his eyes, which involves the danger of losing one's sight.—Donald MacDonald, Salt Lake City, Utah.

Scriber Block with Wide Range of Height Adjustments



Here is a scriber block, having a wide range of height adjustments, that can be made in a short time. A length of flat iron is bent and screwed to a wooden base as shown. A clamp screw is then turned out on a lathe and fitted with a wingnut on one end, while the other end is drilled to receive the scriber. Cold-rolled stock is used to turn out the scriber.



Holder Carries Steel Wedges Safely and Prevents Their Being Lost

Carrier for Wood-Splitting Wedges Slung over Worker's Shoulder

This holder for wood-splitting wedges is useful around the farm for carrying them about and will also prevent them from being mislaid or lost. It is made of 1-in. wood, 18 by 10 in. in size, with suitable lengths of strap iron, formed to fit the wedges, screwed on as shown. A shoulder strap, made from two lengths of leather, one long and one short, is nailed to the edges of the board and fitted with a harness snap and a ring for easy removal.—J. R. Koontz, Bremen, Ind.

Easy Way of Handling Steel Wool



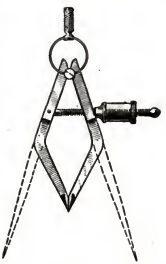
Steel wool can be handled with greater ease and without cramping the fingers, when it is necessary to apply pressure, by wrapping it around a large cork as shown. Use a rag to prevent the fine particles from getting into your skin.

Abrasive Dust on Belts Wears Away Pulleys

Belts that are run in places where the air is full of abrasive dust will wear away the surface of the pulleys, especially at the crown. Although it is general practice to run the belts with the slack side on top, it is a good idea to run them with the tight side on top. In this way the flap or vibration of the belt will tend to shake off the dust, thus preventing it from being carried around the pulleys. The advantage gained by having the slack side on top of the pulleys is offset by the longer belt and pulley life.

Improving Toolmakers' Dividers

In order to make the points of my dividers more effective in scribing, I shortened the legs to add the necessary stiffness, and heated and bent them so the points would touch each other when brought together. Then, I filed the inside of the legs so they were flat and parallel to each other when spread about ¼ in. apart, making a slight angle when brought together. Finally, I ground the outer edges to an angle slightly less than 60 degrees. The points, now about the same angle as the point of the center punch, enabled me to insert one leg in the punch mark while the other cut a neat circle in the metal.—D. W. Patton, Decatur, Ill.



Imitation Ground-Glass Paint

A paint for imitating ground glass can be made by rubbing down zinc oxide with linseed oil to a consistency of thick cream. It should be applied in a thin coat and stippled with a stiff brush. This makes a novel finish for walls.





Making Accurate DOVETAIL JOINTS

By W. Clyde Lammey

IT is comparatively easy to cut accurate-fitting dovetail joints by hand. A template, as shown in Figs. 1 and 2, fitted with suitable guide blocks, is first made in order to obtain uniformity. The dimensions given here are intended for drawer fronts $1\frac{3}{16}$ in. thick, as can be seen from the location of the top guide block. The second guide stop is tacked to the opposite side of the template, with one edge flush with the ends of the sockets, so that the same template can be used in laying out both pins and sockets. The template must be cut to the same length as the width of the drawer front, and the dovetail sockets must be laid out with care, or the joint will not fit.

After the pins and sockets have been marked off on both the drawer side and front, a guide line is scored across the inside face of the drawer front with a marking gauge, set to $\frac{3}{8}$ in., and the same is done on the inside face of the drawer side with the gauge set to $\frac{7}{16}$ in. Next, a $\frac{3}{8}$-in. hole is bored to a depth of $\frac{3}{8}$ in. in all the sockets, as shown in the upper right-hand detail of Fig. 4. A $\frac{7}{16}$-in. hole is then bored through the drawer side, the hole being centered in the waste that is to be removed between pins. This done, the remainder

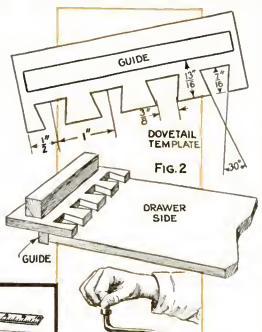


FIG. 2

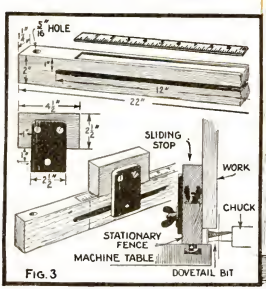


FIG. 3

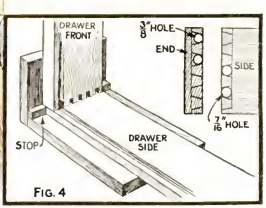
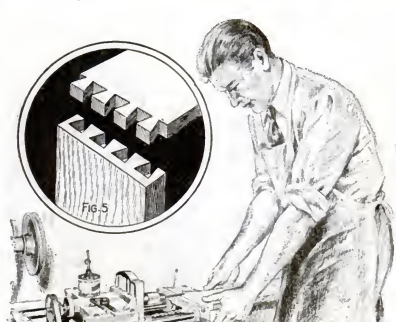
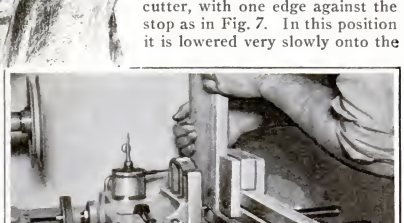


FIG. 4



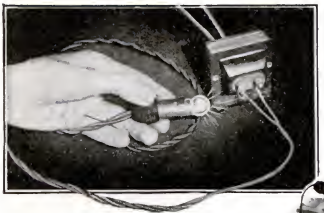
of the waste is easily and quickly chipped out with a sharp butt chisel. The projections between the pins on the template, as indicated in Fig. 2, are wider than those on a machine-made dovetail. In handwork, this additional stock tends to prevent chipping. The size and the angles of the pins and sockets may be varied slightly according to the size of the work. On some types of dovetail work, the template will serve only for marking out the sockets, and the pins may then be laid out from the sockets with the jig shown in the lower-left detail of Fig. 4. A sharp-pointed scriber is used to mark the location of the pins to be cut on the ends of the drawer sides, as in Fig. 1. A jig for cutting the sockets by means of a power-driven mortising machine is shown in Figs. 3, 6 and 7, and the completed joint in Fig. 5. A guide bar of 1¼-in. hardwood is made as in Fig. 3, and is slotted for a ¼-in. bolt. A 10 or 12-in. scale, such as part of a discarded yardstick, is ripped to ½-in. width and set into a ½-in. groove cut in the top edge of the guide. A sliding stop is then made and attached to the guide by means of a ¼-in. bolt and wingnut, the bolt sliding in the slot cut in the guide. A standard dovetail cutter, with ½-in. shank, is tightened in the chuck, and a line, measuring ½ in. from the end of the scale, is scored across the inner face of the guide, which is then bolted to the machine table, so that the line will coincide with the vertical center line of the dovetail bit. The stop is moved forward until the end is exactly even with the end of the scale and is locked by the wingnut. Then the machine table is moved forward and locked, to bring the cutter in position to cut the full-sized socket. The stock to be dovetailed is set on end above the cutter, with one edge against the stop as in Fig. 7. In this position it is lowered very slowly onto the revolving cutter, allowing the cut to progress until the end of the stock rests on the machine table, after which it is carefully lifted clear, the stop moved 1 in. to the left and the operation repeated. In doing this, it is assumed that the cutter is the same size as the dovetail template in Fig. 2. The dimensions of the guide, in Fig. 3, are only approximate, and some slight alterations may be necessary to fit the machine at hand. To aid the cutter in removing the waste, holes may be bored, as in Figs. 3 and 6, in the end.



Making Exterior Paint White

When a mixture of white lead and linseed oil does not give a suitable white color for exterior paint, add a little raw sienna. This tends to neutralize the yellow color of linseed oil, and when the painting has bleached, will produce a comparatively cold-white color.

Small Lamp Illuminates Work Without Glare



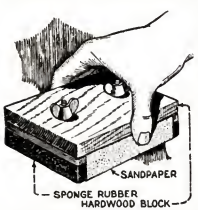


Bell-Ringing Transformer Supplies Current for Auto-Dash Lamp to Illuminate Places Hard to Reach

Here's a good method of getting a concentrated light in some remote part of machinery, in a deep bored hole or a pipe. Another application of the idea is on the table of power-driven machines, to throw light on the work. All you need is a small auto-dash lamp, a socket for it, a suitable length of lampcord and a bell-ringing transformer to step the 110-volt house-lighting current down to the 6 volts necessary for the operation of the lamp. If desired, you can mount the lamp and socket on the end of a long stick to reach into places otherwise difficult to illuminate. The wiring of the transformer socket and lamp is indicated in the left-hand photo, while that on the right shows how the same idea can be used to light the table of a bandsaw. In the latter case, an old auto spotlight and the transformer were both bolted to the machine frame, and the lamp adjusted to throw the light where it was needed. When using a larger lamp than an auto-dash lamp, it may be necessary to get a transformer that delivers more current than that supplied by many bell-ringing transformers. The advantage of using a small lamp is that the troublesome glare of a large lamp hanging in front of you is eliminated.

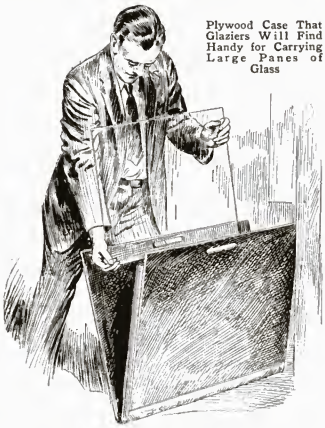
Rubber Pad Improves Sandpaper Block

A pad of sponge rubber cemented to the bottom of a sandpaper block gives it a resiliency desired for smoothing uneven surfaces. Two wooden blocks, 4 in. square, one cut from ¾-in. hardwood and the other from ¼-in. plywood, make up the sander. After clamping the blocks together, drill and countersink two holes through them, from the plywood side, for small bolts, which should project far enough to take wingnuts. After the nuts have been tightened, remove the clamps and cement the rubber pad to the plywood block. In use, the sandpaper is placed on the rubber bottom and clamped between the blocks.



Brazing Extensions on Drills

Tobin bronze is superior to other metals for brazing extensions on drills when a greater length is required. The preparations are the same as for brazing with steel, that is, apply the bronze, grind or file off the surplus material and polish with fine emery cloth. Tobin bronze will give greater strength, due to its lower melting temperature, which does not injure the temper of the drill nor will it cause the drill to break.



Plywood Case That Glaziers Will Find Handy for Carrying Large Panes of Glass

Carrier for Large Panes of Glass

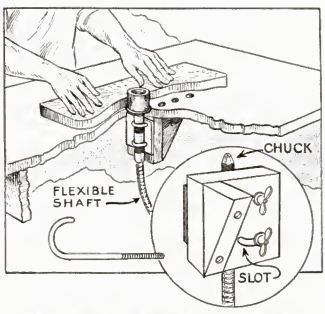
Hinged together by gluing a strip of canvas across the bottom, two pieces of plywood will make a good carrying case for large panes of glass. Before gluing on the strip, place a third piece of plywood between the sides, removing it after the glue has dried. This will provide sufficient space to accommodate several panes. Clamping the pieces together and cutting the handholes will finish the job.

Hints on Lapping Fine Work

Fine lapping can be done as follows: Sift a tablespoonful of emery flour into a glass tumbler, filled with a good grade of lard oil, and allow this to set for a few hours, when the coarser grains will have settled to the bottom of the glass. Then pour off the oil, which will be charged with fine emery particles, and apply it to the lap, a drop at a time. This will produce a bright and fine finish. Loose emery powder should not be added to the surface, as it will roll around and prevent contact of the lapping plates, resulting in a scratchy finish. When doing fine cylindrical grinding or lapping, where the wheel must just touch the work, a good method of telling when both are in contact is to place the blade of a screwdriver on the tailstock and then hold the ear close to the handle. When both are in contact, the vibration will be transmitted to the ear. A sound magnifier of some kind should be used, as otherwise one cannot watch for sparks which would mean too close a contact for very fine work.

Spindle Sander Has Flexible Shaft

For edge-sanding irregular work, an efficient spindle sander can be made from a table, a small sand drum, a length of flexible shafting and a ¼-hp. motor. Bore a hole in the center of the table top just large enough to admit the drum. From 1¾-in. hard-maple stock cut a 4 by 6-in. block, and from 1-in. stock a triangular brace. Screw these parts together as shown. Drill the block to receive two ¼-in. iron rods, 7 in. long, bent to form a hook at one end and threaded for wingnuts at the other. Drill and saw out a slot as shown and also drill and slot a 4 by 5-in. block of ½-in. stock to correspond with the hole and slot in the 4 by 6-in. piece. Attach the flexible shaft by means of the hooked rods and wingnuts to the block assembly and tighten the sanding drum in the chuck, after which the drum is inserted through the hole in the table from the underside and the whole is fastened securely with heavy screws countersunk in the table top and projecting into both brace and block. Connect the end of the flexible shaft to the motor mounted under the table.



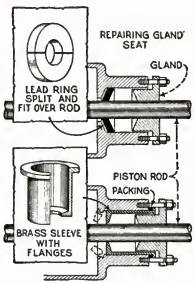
Inexpensive Spindle Sander with Flexible Shaft for Edge-Sanding Curved and Irregular Work

Fan Aids in Printing Large Sheets

When printing large sheets on a self-feeding job press, it was found that they did not settle quickly enough to be flat on the table when the impression was made. To overcome this trouble, a small electric fan was suspended above the press so that the current of air would force the sheet into place, thus avoiding crumpling in the swing of the press.

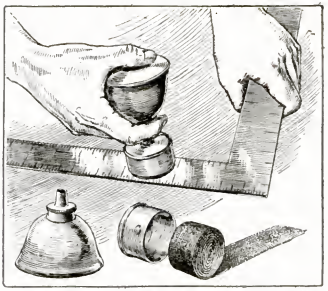
Repairs for Worn or Broken Stuffing-Gland Seat

The stuffing glands on pistons of steam engines or compressors are frequently worn to the point where the packing will push through and cause constant trouble. To prevent this, split a lead ring of the proper size, fit it over the piston rod and drive it up tight against the seat. This will effectively stop the leak and will cause no wear on the rod. If wrenching on the stuffing gland has fractured the seat, make a brass sleeve, with an inner and outer flange as shown in the lower detail. Place a ring of packing under the rear of the outside flange and the rod packing inside as usual. Tightening the gland will then make both packings tight. While it is possible to split the sleeve and assemble it without dismantling the seat, a better packing job will result if a solid ring is used.



Reading Meter with Broken Needle

Difficulty experienced in reading a meter that has a broken needle can be overcome by holding a piece of celluloid on which a narrow line has been painted, in front of the dial, against the glass with the line over the remaining portion of the needle. The line will then point to the correct reading on the meter.



Can with Roll of Burlap Oils Tools without Waste of Lubricant

Handy Lubricator for Your Tools

Here is a can for oiling your tools that will not waste any of the lubricant. Take an oilcan, remove a portion of the spout and to this solder a small tin can, which has been cut in half. Ribbon burlap, which acts as a sponge to prevent the oil from feeding too fast, is rolled to fit snugly inside of the can and to project about ⅛ in. beyond its edge.

Emergency Square Easily Formed from Folding Rule

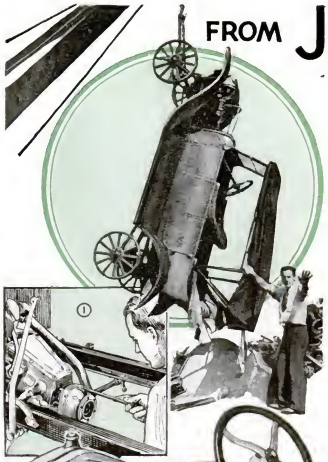
With slight alteration, the first three sections of a folding rule can be used as an emergency square. The first section of the rule is folded as shown and squared with the third section and a small bolt is then fitted into a hole drilled through the crossing sections to hold them in place. It takes only a few seconds to form a square in this way and if carefully made, accurate results are assured.



¶Never keep a gasoline torch more than three-quarters full, and it will be found that the torch will last much longer without need of repairs.

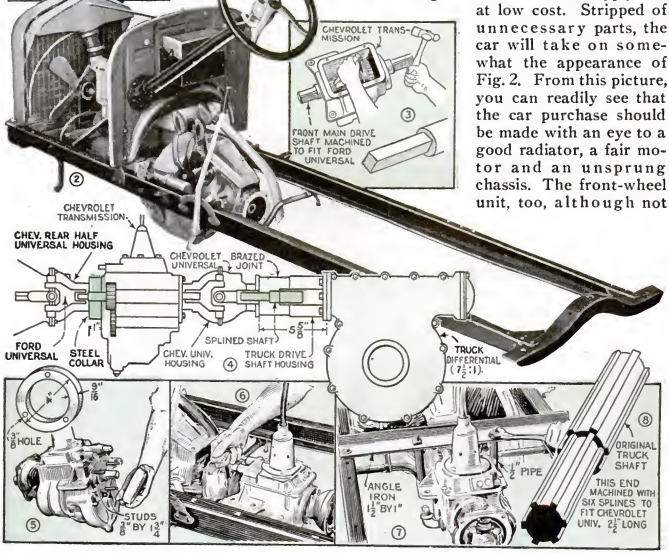
No blueprints. 6/18/32

FROM JUNKPILE TO



CAPABLE of pulling any two-horse load with ease, at good speed and nominal gas consumption, this homemade tractor, made from junk automobile parts, costs only about $50 to build. Although a low hitch is provided on the rear-axle housing, the high hitch, also shown, is safe for most loads, as it was found that, with the tractor anchored, in several tests to determine its turn-over tendency, the forward wheels lifted 15 in. but no more. To insure a more efficient cooling and lubricating system than that provided on a Ford model-T motor, which is used in this tractor, a water pump and an oil pump may be added, but these details are left entirely to the discretion of the builder.

Starting out, you will need an old Ford passenger car. If you already have one, well and good; if not, your local junkyard or wrecking establishment will supply one at low cost. Stripped of unnecessary parts, the car will take on somewhat the appearance of Fig. 2. From this picture, you can readily see that the car purchase should be made with an eye to a good radiator, a fair motor and an unsprung chassis. The front-wheel unit, too, although not

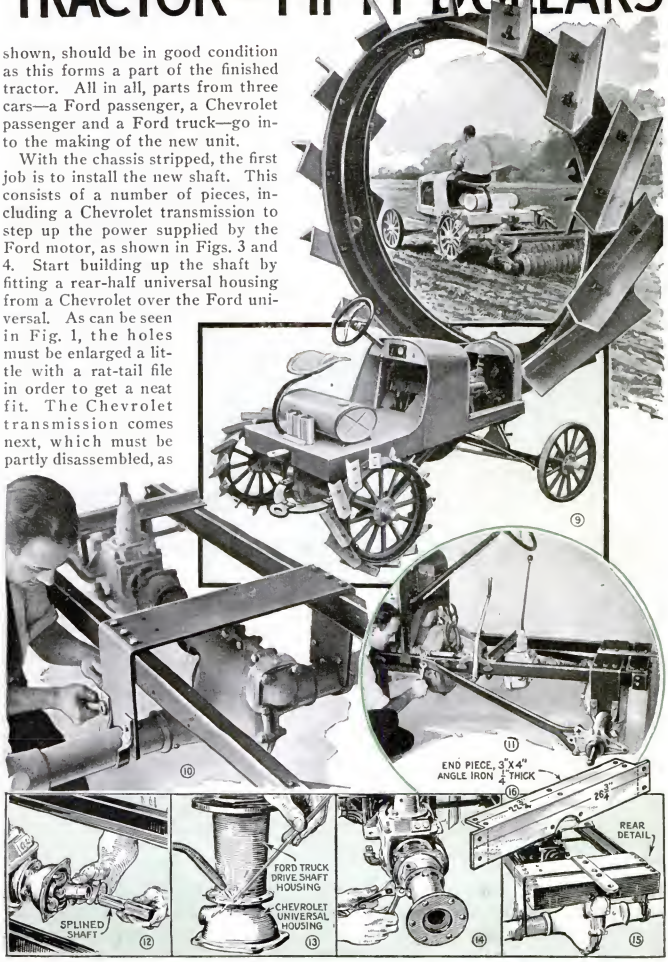


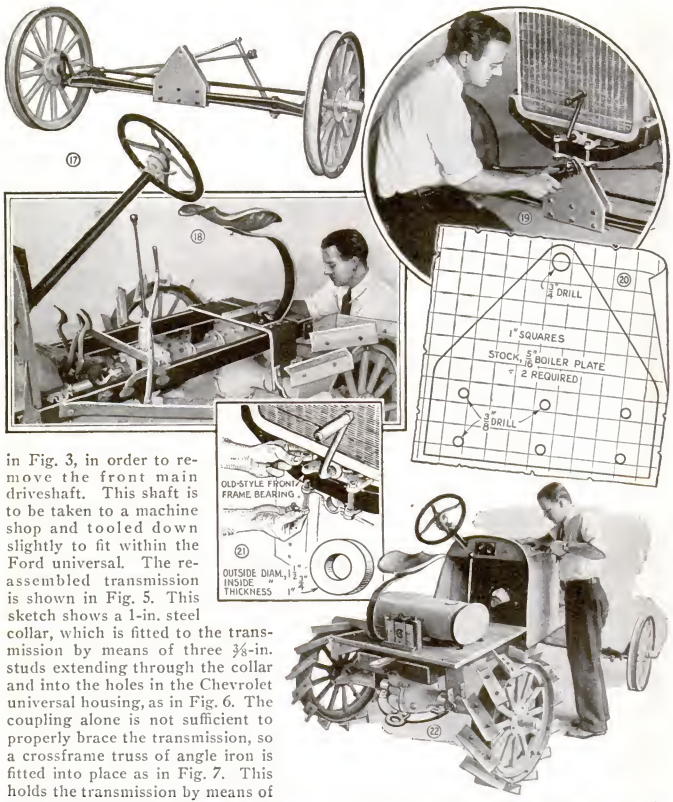
Parts from { Shaw Mfg Co
R No 2 Galesburg Kans

TRACTOR FOR FIFTY DOLLARS

shown, should be in good condition as this forms a part of the finished tractor. All in all, parts from three cars—a Ford passenger, a Chevrolet passenger and a Ford truck—go into the making of the new unit.

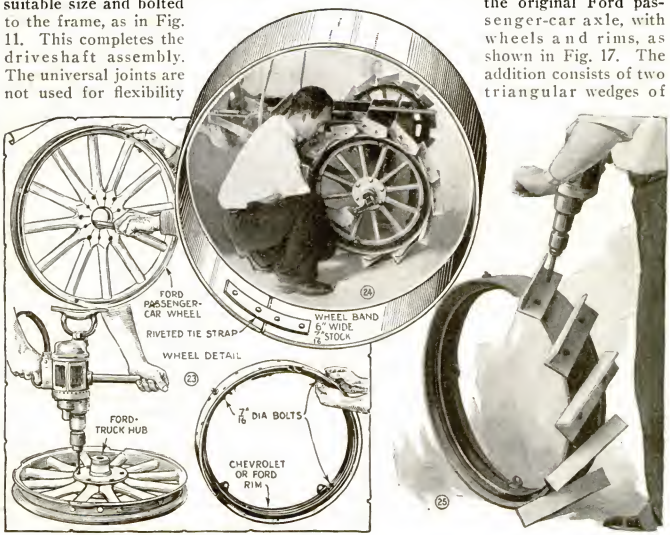
With the chassis stripped, the first job is to install the new shaft. This consists of a number of pieces, including a Chevrolet transmission to step up the power supplied by the Ford motor, as shown in Figs. 3 and 4. Start building up the shaft by fitting a rear-half universal housing from a Chevrolet over the Ford universal. As can be seen in Fig. 1, the holes must be enlarged a little with a rat-tail file in order to get a neat fit. The Chevrolet transmission comes next, which must be partly disassembled, as





in Fig. 3, in order to remove the front main driveshaft. This shaft is to be taken to a machine shop and tooled down slightly to fit within the Ford universal. The reassembled transmission is shown in Fig. 5. This sketch shows a 1-in. steel collar, which is fitted to the transmission by means of three ⅜-in. studs extending through the collar and into the holes in the Chevrolet universal housing, as in Fig. 6. The coupling alone is not sufficient to properly brace the transmission, so a crossframe truss of angle iron is fitted into place as in Fig. 7. This holds the transmission by means of two long bolts, properly spaced by means of two ½-in. pipe nipples. A second trip to the machine shop is necessary to have the shaft splined as shown in Fig. 8. The heavy portion is already splined to fit the Ford truck differential of which it is a part, but the splines on the lower half must be machined to fit the Chevrolet universal, as shown in Fig. 12. Next, a 5⅝-in. length, cut from the rear of the Ford truck driveshaft housing, is brazed to the Chevrolet universal housing, as in Fig. 13. The jointed parts are then bolted into place, as in Fig. 14, with the splined shaft inside. The final piece is the Ford truck differential, which is bolted to the shaft housing. A detail of the manner of supporting the differential is given in Fig. 15. A length of boiler plate, 6 in. wide by ½ in. thick, is turned over at right angles, and the ends are cut out to fit over the axle, fastenings being steel straps twisted

to shape and bolted into position (Fig. 10). Fig. 16 shows the endpiece. The exact line on which to cut off the chassis is determined by this piece, the cut being made so that the endpiece can be bolted to the rear of the differential, as shown. Additional bracing is provided by the original truck trusses, which are cut to suitable size and bolted to the frame, as in Fig. 11. This completes the driveshaft assembly. The universal joints are not used for flexibility but only to insure simple and satisfactory couplings.



Now for the rear wheels. Each of these is made from a Ford passenger-car rear wheel, the original hub being removed and the hole for it enlarged with a file so that a truck hub may be substituted, as in Fig. 23. The latter should be placed so that the bolt holes of the hub will come between the old ones, in order to assure sufficient holding qualities. The outer part of each wheel is made from a 7/16 by 6-in. iron band, bent to fit a Ford or Chevrolet rim and fastened with three bolts as shown in the right detail of Fig. 23. Each wheel is fitted with thirteen cleats which are 11 or 12-in. lengths of 2 by 2½-in. angle iron. Fitting is best done by drilling the cleats first, then drill thirteen evenly spaced holes around the rim, and, finally, use a fit-and-try method to locate the remaining holes, as shown in Fig. 25. The cleats are fastened at an angle of about 45°.

The forward-wheel assembly includes the original Ford passenger-car axle, with wheels and rims, as shown in Fig. 17. The addition consists of two triangular wedges of boiler-plate stock, cut to the dimensions given in Fig. 20. The holes for the six bolts that hold these plates to the axle must be drilled very carefully so that the bolts will be tightly wedged into position. The slight swelling of the axle at this point will be sufficient to keep the plates firmly in place. Fastening the front wheels to the frame is accomplished by using two old-style front-frame bearings (Ford), which are bolted on either side of the frame as in Fig. 21. Such bearings can only be found on models up to and including the 1921 Ford. The opening in the lower bearing is fitted with a bushing, to take a ¾-in. bolt, passing through the top of the triangular plates. The unit is

assembled as in Fig. 19, using lock washers under the nuts. As a tractor has a decided tendency to set nuts spinning, it is a good idea to use lock washers wherever possible throughout the entire assembly. One other thing about the front wheel assembly: For light truck farming, the original steering-gear tie-rod can be left in place, but if you anticipate heavy duty, you may as well remove this now as later and substitute a heavier rod. The strain on the rod, especially when the wheels are tipped in and out of a furrow, is considerable, and a light rod will usually buckle.

The rest of the job consists of finishing touches. You may use a standard tractor seat, fitting this into place with a fairly flexible length of steel, as in Fig. 18. Wood flooring is nailed over two lengths of 2 by 4-in. stock, preferably hardwood, bolted to the frame. The gas tank is mounted under the seat, and, in this position, allows a gravity feed to the carburetor. Starting is done by hand, with an ignition battery strapped into place behind the gas tank.

Although it adds nothing to the running qualities of the machine, a simple sheet-metal cowling will greatly improve its appearance. This should be made to run from the original dashboard back, with lighter lengths turned over at right angles, fitting over the frame at the front and along the flooring at the rear, as can be seen in the picture of the finished job. With this cowling, a wooden instrument board may be fitted neatly within the metal hood, as shown in Fig. 22. The original Ford hood can be used over the motor.

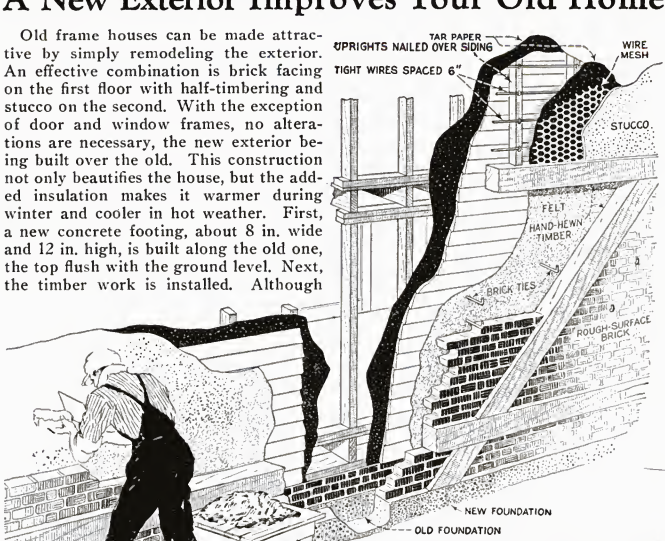
Two examples of hitches are shown in Figs. 9 and 22. The higher one is used for light loads, while the lower hitch is best for heavy loads. The upper one consists of a piece of heavy iron plate securely bolted to the rear crosspiece as shown in Fig. 15, while the lower one comprises several individual pieces, riveted or welded together, and is attached to the rear-axle housing. Running the tractor may be a little puzzling at first, especially if you have had no experience with a model-T Ford. With both transmissions in high, the tractor is simply a Ford truck with a 7½ to 1 ratio between motor and rear wheels. There are, however, several intermediate combinations of gearing which will readily allow even the slowest plowing speed without stalling the motor. Normal tractor speed is obtained by putting the Ford transmission in high and the Chevrolet in first. One hour at the wheel will show what this tractor will do.

If the instructions given in this article are carefully followed, no difficulty will be experienced in building the tractor. You might question the fact that passenger-car wheels were used on a truck rear end, but this arrangement was found most practical as truck wheels were too small, being 3 in. less in diameter than the passenger-car wheels. When you have completed this tractor, you may be assured that it has plenty of power for average work, and will be found especially suitable for truck farming.



A New Exterior Improves Your Old Home

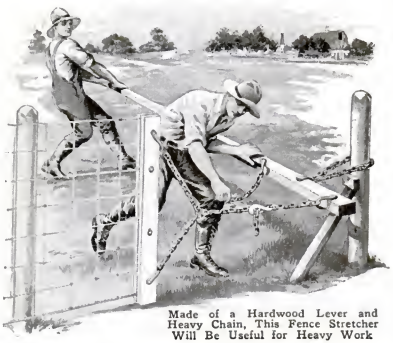
Old frame houses can be made attractive by simply remodeling the exterior. An effective combination is brick facing on the first floor with half-timbering and stucco on the second. With the exception of door and window frames, no alterations are necessary, the new exterior being built over the old. This construction not only beautifies the house, but the added insulation makes it warmer during winter and cooler in hot weather. First, a new concrete footing, about 8 in. wide and 12 in. high, is built along the old one, the top flush with the ground level. Next, the timber work is installed. Although solid timbers are shown in the drawing, they may be built up of planks and adzed to give the hand-hewn effect. On the first floor, a layer of 15-lb. felt is applied over the siding, and on the second, 2 by 2-in. uprights are nailed to it, directly over the studs beneath. On these, lengths of No. 12 galvanized-iron wire are stretched horizontally, spaced about 6 in. apart, to prevent the tar paper, which is to be applied next, from sagging when stucco is put on. Wire mesh is laid over the tar paper to anchor the stucco. On the first floor, rough-surface brick is laid around the timber work, and, if desired, the work can be varied by laying in bricks of dark tones here and there. For the brick construction brick ties are required, these being driven into the siding as shown in the illustration. In case both first and second stories are to be given a stucco finish, it is not necessary to carry the new exterior so far out from the original siding. Instead of the 2 by 2-in. uprights, 2 by 1-in. slats can be used.



Old Homes Made Modern by Clothing Them with a Coat of Brick, Half-Timbering and Stucco, Which Also Improves Insulation

Correct Grinding for Lathe Tools

To get the utmost efficiency from tungsten-carbide lathe tools, they should be ground as follows: For general work, they should have a clearance of 7°, a tool angle of 72°, a top rake of 11° and a side or back slope of 4°. For hard iron, allow a clearance of 3°, a tool angle of 83°, a top rake of 4° and a side or back slope of 4°. For soft steel, they should have a clearance of 8°, a tool angle of 62°, a top rake of 20° and a side or back rake of 4°.



Made of a Hardwood Lever and Heavy Chain, This Fence Stretcher Will Be Useful for Heavy Work

Wire Stretcher for Heavy Work

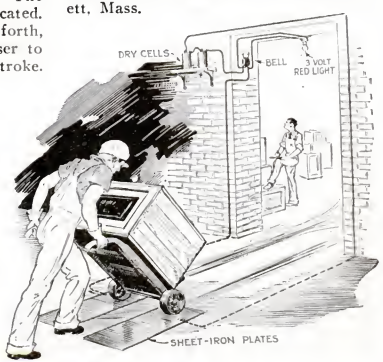
Fastened to a well-braced post, this wire stretcher will be useful in work where considerable strength is required. A 10-ft. piece of 2 by 6-in. hardwood forms the lever, which has three holes drilled about 10 in. apart at one end to take clevises. A suitable length of chain for anchoring the stretcher to a post is fastened to the middle clevis, while 2½-ft. lengths, fitted with hooks, are fastened to the two others. Two pieces of 2 by 4-in. stock are clamped over the wire by means of bolts. The clamp is fitted with a chain as indicated. In use, the lever is moved back and forth, the loose hook being brought closer to the wire at the beginning of each stroke. —Floyd Mix, Chicago.

Oil-Soaked Leather Belting Easily Cleaned

Oil applied to leather belting to keep it pliable will in time cause it to slip. If the slippage is excessive, the belt will also become burned and will crack. To avoid this, improve the oiling conditions so there will be no leakage or spattering of the oil. Also use a belt that is as immune to oil as possible, and clean it periodically. A number of cleaning agents are available for this purpose, such as gasoline, naphtha, alcohol, etc. Coil the belt loosely, immerse it in the cleaning fluid and leave it there overnight. Then remove the belt and allow it to dry for about 10 hours. Most of the dirt and grime will be loosened and will settle to the bottom of the container, but that remaining on the belt can usually be removed by brushing or scraping. When the belt is dry, lubricate it with a suitable dressing and it is ready for use again.

Trucks Approaching Doorway Ring Signal Bell

To prevent workmen from being hit by push trucks in a narrow shop doorway, I installed a signal by fastening two sheet-iron plates to the floor near the door opening on both sides. The plates were connected to a doorbell circuit so the wheels and axle of a truck passing over them closed it, ringing a bell and lighting a 3-volt red lamp over the entrance. The wiring and installations are shown in the drawing. A similar circuit was also adapted to the freight elevator, so that the trucks automatically called the operator as they approached the elevator. This method can also be used with rubber-tired trucks by attaching springs or chains to the axle to drag on the plates.—Geo. F. Read, Everett, Mass.



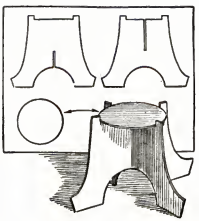
Trucks Passing over Metal Plates, Placed at Approach to Shop Door, Ring Signal Bell

Magnet Retrieves Small Parts in Auto Motor

For retrieving screws, nuts, etc., that have been dropped into places hard to reach, an electromagnet can be made from a discarded Ford coil connected to the electrical circuit of the car. Open the case, remove the secondary winding from the iron-wire core, but leave the primary winding intact. To the ends of this winding, solder two lengths of wire provided with spring clips. In use, one lead wire is clipped onto the positive terminal of the battery and the other is fastened to the motor or frame to provide a ground and complete the circuit through the coil.

Collapsible Stool for Window Trimmers and Merchants

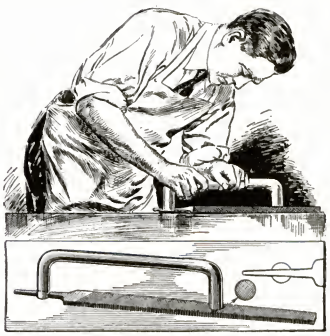
Window trimmers will find this stool useful, as it is easily taken apart and occupies little space when packed. It can be made of wood or metal, and consists of two pieces, shaped as shown, one being slotted at the top and the other at the bottom. A projection at the top of each edge holds the circular seat in position. If all parts have been correctly cut, the stool will be rigid.—E. A. Hoppman, Dumont, N. J.



Coloring Detects Glue Spots

As glue has a color so near that of natural wood, spots are often overlooked and not removed when finishing furniture. In order to be sure that all the spots would be seen and removed, a manufacturer used a vegetable dye to color the glue before using it. Dyes containing acids should not be used for this purpose, as the acid will interfere with the adhesive qualities of the glue.

¶Press marks on mohair-covered furniture are easily removed by rubbing with damp cheesecloth.



This Handle, Fitted to Tang of File, Insures Firm Grip When Surfacing Flat Work

Raised File Handle Prevents Injury to Fingers

When filing flat surfaces, the illustrated file handle will prevent injury to the hands. It is simply a length of soft iron or brass rod bent as shown. The rod should be large enough in diameter so that a slot can be filed in one end to fit the tang of the file securely. Both ends are bent over at right angles, about 2 in. from the end, to enable the user to grasp the tool comfortably.

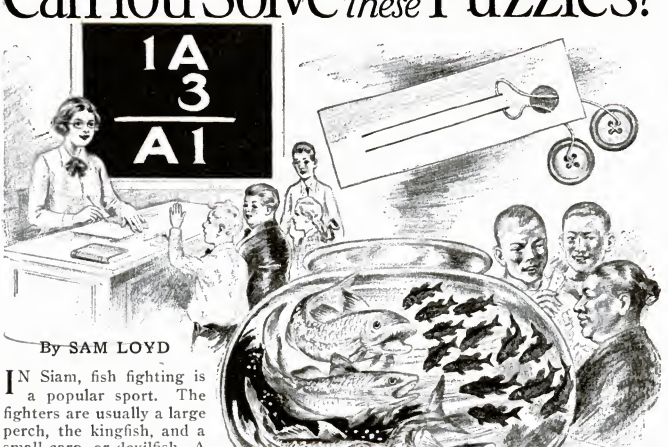
Tool for Chipping Glass

Here is a tool that has been used successfully for chipping glass. It is a length of flat iron, having one end notched and cut out to the shape shown, the size of the notch depending on the thickness of the glass to be chipped. It is necessary to have a different size notch for each thickness. If the edge of the glass is cut evenly and a firm snap given to the tool for each notch, the broken-off chips will all be the same size.



Ga2254
153 Halsey St. Brooklyn, NY

Can You Solve *these* Puzzles?



By SAM LOYD

IN Siam, fish fighting is a popular sport. The fighters are usually a large perch, the kingfish, and a small carp, or devilfish. A kingfish can easily lick one or two of the devilfish, but three of the little fellows will hold him at bay. When four combine against a king, they will dispatch it in three minutes. Now let us pit thirteen of the devilfish against four of the kings. Puzzle: How long should that thirteen to four battle last?

MRS. Terwilliger said to her class: "The letter A represents a number of five figures. If you place the figure 1 before it, and multiply the number by 3, the product is A1. Now, what is A?"

CUT two parallel slits in a strip of leather or strong paper, and below them, a round hole. Fit with string and buttons as shown. Can you take the string and buttons out without tearing or untying anything?

Answers to Last Month's Puzzles

From what Mrs. Terwilliger told us last month, A must represent 2 and B, 5. With A in the ten-column and B in the units, the number AB may be expressed by 10A plus B. Reversing the order, we have 10B plus A, and this number was 2 more than twice the other. Doubling the first number and adding 2 we have 20A plus 2B plus 2, which equals 10B plus A, or, stated in another way, 19A plus 2 equals 8B. Now 2 is the only digit which, taken 19 times and added to 2, gives a number divisible by 8. Thus 40 divided by 8 makes B equal 5.

If the monkey climbed six feet up the rope, he would ascend three feet, the weight would ascend three feet and they both would stop four and one-half feet above the ground. The weight would already have pulled the monkey up eighteen inches.

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No. 1545.—Hand drill pattern. Capacity, ⅜". **$10.00.**





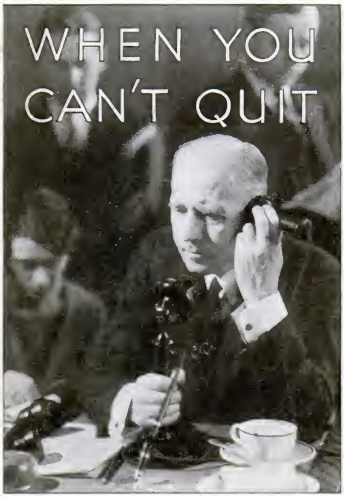
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• • •

Far too many men *shave,* without being *clean* shaven. The blade you choose and the way you use it make the difference. Of course you can't shave your way to independence, but a fresh, immaculate appearance will help. On the other hand, the slightest growth of stubble is a handicap.

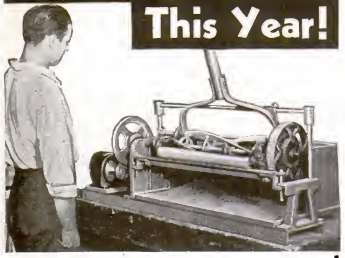
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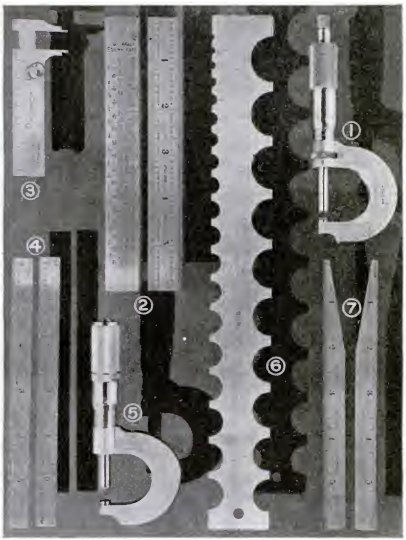
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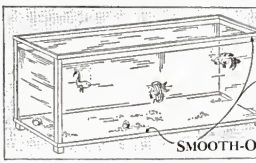
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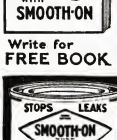
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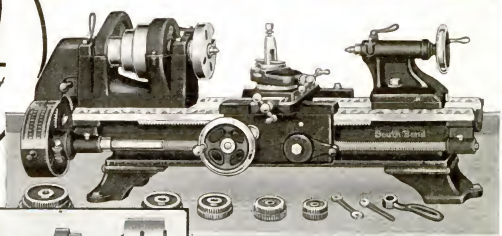
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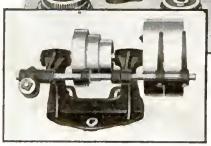
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$7.00 a month
for 12 months

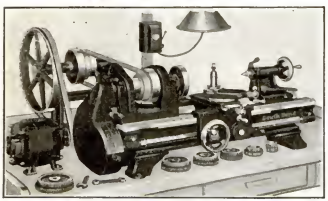


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8" x 24" Junior Back Geared Screw Cutting Precision Bench Lathe with Tight and Loose Pulley Countershaft and Equipment, $20 down, $7 per month. Net Weight 175 lbs. **$100** f. o. b. factory



8" x 24" Junior South Bend Back-Geared, Screw Cutting, Precision Bench Lathe, with graduated Compound Rest, Horizontal Drive Unit and Lathe Equipment **$115.00**

¼ H. P. Non-Reversing Motor, 1800 R. P. M. (1-phase 60 cycle A. C. 110 volt)	$12.00
"V" groove pulley for motor	1.25
Knife Switch, enclosed type	1.50
"V" Belt, Motor to Drive Unit	.75
Flat Leather Belt, Drive Unit to Lathe Spindle (1"x72")	1.25
TOTAL Price of Lathe and Motor Drive Complete	**$131.75**

In the tabulation above we itemize motor and motor drive equipment so you can purchase only the parts you need. This applies to any 8" bench lathe with various bed lengths.

Prices of 8" Junior Lathes with Longer Beds

	Between Centers	Net Weight	With Countershaft Drive	With Motor Drive
8" x 24"	6"	175 lbs.	$115	$131.75
8" x 30"	12"	190 lbs.	$120	$136.75
8" x 36"	18"	205 lbs.	$125	$141.75
8" x 42"	24"	220 lbs.	$130	$146.75

For lathes with plain rest, deduct $15 from above prices.

Lathe Builders Exclusively for a Quarter of a Century
Over 55,000 Lathes in Use

A lathe of the same high quality, accuracy, precision and up-to-date mechanical features which characterize the complete South Bend line. This new 8" Back-Geared Screw Cutting, Precision Bench Lathe can be used for the finest work in tool room and shop—for gauges, small tools, dies, etc.—for auto service, electrical manufacturing, home work shop and laboratory.

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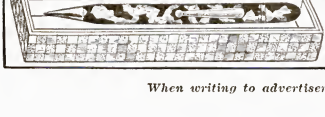
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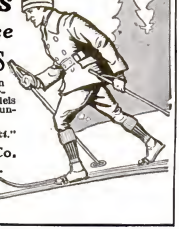
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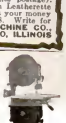
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28x5.25-18"	2.95	1.25
30x5.25-19"	2.95	1.25
30x5.25-20"	2.95	1.25
31x5.25-21"	3.00	1.25
28x5.50-18"	3.20	1.30
29x5.50-19"	3.20	1.30
30x5.00-18"	3.20	1.30
31x6.00-21"	3.20	1.35
32x6.00-20"	3.20	1.35
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33x4½	3.20	1.35
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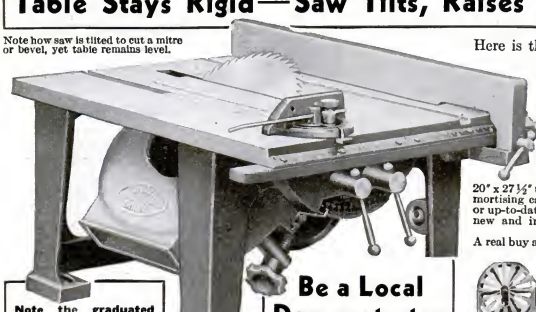
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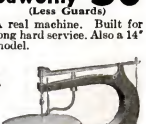
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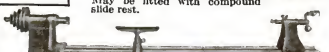
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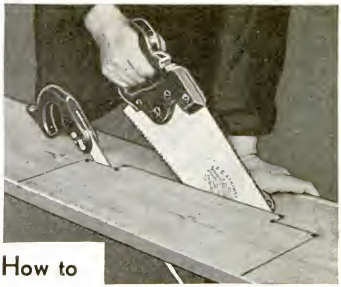


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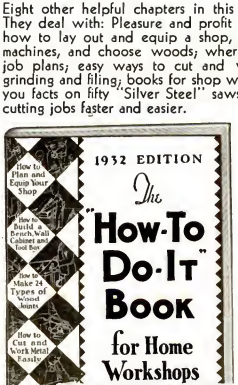
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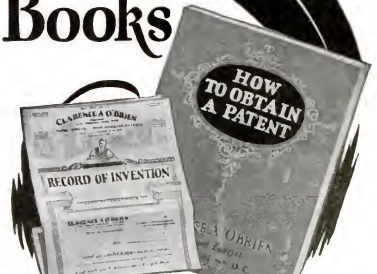
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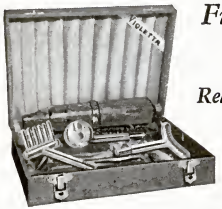
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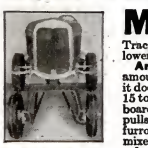
GREATLY REDUCED PRICES

To meet present conditions, we have greatly reduced prices on SHAW Tractor Equipment. Get your SHAW Equipment now and build tractor during spare time—or buy it complete.

EASY TO BUILD WE TELL YOU HOW

For Model "T" and "A" Fords, Chevrolets and other make cars.

Cuts Your Production Cost!



Front view of SHAW-Tractorized Model "A" Ford. Shows New HIGH ARCH, allowing for clearance of tall corn, cultivating 1 to 2 rows at one time. Regular cultivator beams may be used.

MAKE more money! Do it by making a powerful, dependable tractor from your old Ford, Chevrolet or other old car—with sturdy SHAW Tractor Equipment. The SHAW-Tractorized Car, by saving valuable time and costly labor, greatly lowers production cost. Pays for itself in one season!

Amazing All-Around Performance—Does more for small amount of money invested than any other tractor. Tests have proved it does all farm power work as well as expensive tractor. Cultivates 15 to 20 acres per day. Turns about 5 to 10 acres per day with mold-board plow. Handles 16-in. plow, or two 12-in. plows nicely. Easily pulls heavy, steel road drag. Can also be used to seed, harrow, furrow, harvest, haul; run log saws, feed grinders, concrete mixers, pumps and other belt machinery.

Low Cost—You can have a SHAW Tractor at surprisingly low cost—**on Easy Payments.** SHAW Tractor Equipment costs little—at **New Reduced Factory-to-You Price.** If you haven't an old car, you can pick up an old Model "T" Ford or Chevrolet for $5 to $25; or a Model "A" Ford chassis, which has had the body wrecked, very cheaply. Many Model "A" Fords are now being converted into SHAW Tractors. SHAW Equipment, bought now for a Model "T" Ford, can later be installed on a Model "A." Many attach SHAW Equipment to other makes of cars.

Anyone Can Attach SHAW Equipment quickly and easily, using only monkey wrench and screw driver. You don't have to be a mechanic. We furnish all parts, easy-to-follow directions. Can be attached to full-length or sawed-off chassis.

Make Tractor New—Remember Reduced Price is subject to change any day. So make your tractor now. SAVE MONEY! Mail Coupon for full information—TODAY!

SHAW MFG. COMPANY
Dept. PM-2 GALESBURG, KANSAS

Rear view shows New HIGH ARCH, which enables tractor to clear corn 80-in. high, cultivating 1 to 2 rows at a time.

DOES ALL FARM WORK



SHAW-Tractorized Ford plowing.



SHAW DU-ALL Tree and Garden Sprayer
Kills insects that injure trees, shrubbery and garden produce. Reaches tops of tall trees. Fine for orchard and potatoes. Kills hogs and cattle of ticks and lice. Has 50-gal. barrel. Two 15-ft. discharge hoses with 8-ft. pipe extensions and nozzles. (Capacity for 8 nozzles.) Pressure gauge. Mounted on *regular SHAW DU-ALL Garden Tractor*—see below. Coupon brings details. Reduced Price, *10-day Trial Offer*, Easy Payment Plan.

SHAW DU-ALL GARDEN TRACTOR
Great time, labor, money-saver for farms, truck gardens, nurseries, poultry ranches, estates, etc. Plows, harrows, seeds, cultivates, harvests, mows; runs saws, washing machines, pumps, etc. 5 sizes, 1 to 8 horsepower. Costs 2 to 4c per hour to run. Briggs and Stratton engine. Has gear shift; 3 speeds forward, and reverse. Coupon brings details. Reduced Price, Easy Payment Plan. 10 day trial offer.



SHAW Tractorized Model "T" Ford of Jacob Kraft, E. Rutherford, N. J.; equipped with extra wide wheels and Cutter Bar Attachment.



FREE BOOKS

Coupon below brings FREE Book, containing full information, new Reduced Price and Easy Payment Plan on 1932 HIGH ARCH Model, and FREE SHAW DU-ALL Garden Tractor Catalog. Mail Coupon TODAY!



MAIL COUPON FOR FREE LITERATURE

SHAW MFG. CO. Dept. PM-2 Galesburg, Kansas

Gentlemen: Please send me at once the FREE Literature checked below, and New Reduced Price. No obligation on my part.

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☐ Literature on SHAW DU-ALL Garden Tractor
☐ Literature on SHAW Tree and Garden Sprayer
☐ Generous Introductory Offer

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easy AS LIGHTING THE LIGHT!

What? You've never tried to be your own radio expert? Well . . . get going now, with Kester Radio Solder. It's *easy*, and it's absolutely safe. Look . . . all you have to do is apply heat, then go to work, because Kester carries its flux inside itself. This flux is *plastic* rosin, too. Non-corrosive. A non-conductor. It prevents electrical leakage thereby aiding receptivity. You can *hear* the difference!

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PAINT *with* ELECTRICITY
Easier – Quicker – Cheaper – Better



Speed up paint jobs—get better results on any kind of a paint, varnish or oil job. Sprays insecticides effectively. Earn money doing neighbors' jobs—save money on your own. **Fully guaranteed.**

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OIL BURNERS
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We furnish all parts cut to fit; numbered and ready to assemble for the following models: Clipper Ship and Flying Cloud (with electric lights), Santa Maria, Mayflower, La Pinta $4.50 -Constitution, $5.98—SPANISH GALLEON electrically equipped, $6.98—COACH MODELS, Gen. Washington, Princeton to Philadelphia, TALLY-HO, Deadwood, Overland Western, DeLUXE HOUSES with electric lights $2.95. Our new Illustrated Catalog FREE on request. All models sent C. O. D. Foreign orders accompanied by check or money order.

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Brings in stations 9,000 to 10,000 miles away with full volume and clarity. Major stations all over U. S. come in like locals. Every receiver laboratory-built and tested on 12KO Rome and GSSW Chelmsford, England before shipping. Write

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Improved WORKACE WOODWORKER

Convert lumber into furniture, novelties and other articles. Work out ideas with your own complete electric workshop. Turn, saw, plane, grind, sand, buff, and jig saw with Workace. Simply plug in electric light socket. Improved model at sharply reduced price.

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4" Planer, 8" Circular Saw, 8" x 36" Lathe, 8" Sander, 6" Buffer, 5" Grinder, Drill Chuck, Jig Saw attachment, work table, ¼ H. P. Motor, V-belt, Pulleys, Guards, Sub Base, Cable and Plug.

Workace and Ace Machines are made, guaranteed and serviced by the largest manufacturers of portable woodworking machines.

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SEND FOR FULL SIZE ILLUSTRATION OF WORKACE WOODWORKER

MAGIC FLUID

COL-GRA'PHOIDS MOTORS



PLATED LUBRICATION

saves on Gasoline, Oil & Motor Expense

AUTOMOBILE, Airplane, Tractor, Truck and Machinery Owners! Think of it! A revolutionary discovery now "plates" lubrication on all moving parts. Automobile owners, airplane pilots, engineers and other Col-gra users, are amazed at its action. **"Like Magic"** is the best description of it.

REVOLUTIONARY DISCOVERY

Added to the oil and gasoline, Col-gra seeks all friction parts, where under heat, speed and pressure, it quickly forms an almost frictionless Col-gra'phoid surface. This means smoothness—quicker acceleration—amazing savings on gas, oil and repairs.

PROVEN BY TESTS

On a recent test of a Col-gra'phoided motor, four engineers ran an automobile, without the slightest motor injury, for 29 miles without oil, proving beyond all doubt the ability of this surface to lubricate even in the complete absence of oil. Laboratory tests further show the amazing difference between treated and untreated friction surfaces.



PAYS FOR ITSELF

Because Col-gra reduces friction, gives more power, frees valve action, reduces carbon, heat and wear, and prevents bare metal-to-metal contact, it gives motorists many added miles with less cost. Col-gra quickly pays for itself many times over in savings on repairs, motor fuel, oil, starter and battery.

SALESMEN AND DISTRIBUTORS
Good Territory Open

Wonderful opportunity for salesmen and distributors. Earnings up to $100.00 a week and more. Valuable territory still open. For complete information check and mail the coupon.

THE COL-GRA COMPANY

Dept. 1504, 2621 N. 3rd St., Milwaukee, Wis.

SNAPPY WINTER STARTING

In cold weather when the oil is too thick to flow or too thin to lubricate properly, Col-gra'phoid surfaces provide snappy winter starting. Reduces bare metal-to-metal friction—prevents serious damage.

MORE POWER - PEP - SPEED

Col-gra users everywhere are enthusiastic. **"I am pleased with results,"** writes Frank Eastwood. "The motor's smoothness is almost beyond belief. My mechanic says it can't be the same engine." Paul Canalizon: "Col-gra gives the car more power—speed—pep and gas mileage." W. P. Barrows: "My car runs much smoother, uses less oil and has more pep." E. C. Bergman: "Col-gra helps the motor a whole lot—is working more freely and less vibration."

HEAT AND COLD PROOF

Col-gra's patented ingredients manufactured at 7500° assure positive lubrication. No motor heat too great. No temperature too cold—lubricates at 100° below zero. Gasoline cannot wash it off. It stays put!

Why spend money needlessly for gasoline, oil and repairs—why operate your motor just partly efficient? Find out all about this magic fluid **"Col-gra"** now and let it start saving money for you.

FREE OFFER COUPON!

THE COL-GRA COMPANY,
Dept. 1504, 2621 N. Third St., Milwaukee, Wis.

Gentlemen: Please send me full particulars together with your free Col-gra trial offer. This does not obligate me in any way.

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Regular $102.50 Model
Easiest Terms Ever Offered
Small Carrying Charge
Now Only $42.90

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Prices Smashed to Rock Bottom

Now Only $ DOWN

Save over ½ Mfgs. Original Price



Only by an exceedingly fortunate purchase direct from the manufacturers am I able to offer this amazing low price—less than half (½) the manufacturer's original price—and easy terms besides. This is the full-sized late model Underwood with standard universal 4-row keyboard of 84 characters and has all late improvements. Manufactured to sell originally for $102.50. Fully guaranteed.

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Learn Touch typewriting. Complete Home Study Course of the Famous Van Sant Touch Typewriting System, fully illustrated, given during this offer. Easily learned. Used in schools, business offices everywhere.



BRAND NEW **CORONA**



Now Only $39.90 or On Easy Terms

10 Day Trial

Yours for Only $1.00 DOWN

Hurry! Only a very limited number of these **Brand New** Coronas available at this **Special Low Price** and **Easy Terms.** Here's your chance to own a wonderful nationally advertised Corona at a **real bargain.** Has up-to-date improvements and carries our regular New Machine guarantee. Sent on 10-day trial. (If you decide to keep it send only $3 a month until the special low price of $42.90 (term price) is paid.)

Easy Terms—Only 10c a Day

Think of it—a genuine late model Underwood No. 5 reduced to $42.90 (cash).

Send only $1 deposit for a 10-day Trial. Then only 10c a day on my easy year-to-pay plan. Use and enjoy your typewriter all the time. Remember this famous No. 5 Underwood all renewed and refinished is without question one of the greatest values ever offered.

Money Back Guarantee

Accept my liberal 10-day trial offer. See for yourself the wonderful bargain this famous Underwood really is. Your deposit returned at once if you are not perfectly satisfied. Send now.

Over 100,000 Satisfied Customers

International Typewriter Exchange
231 West Monroe St., Chicago, Ill., Dept. 201

Please send the typewriter marked below, F.O.B. Chicago, at the special reduced price for 10-day Trial. I am enclosing $1.00 deposit on the Underwood No. 5 at $47.90 (term price); Corona No. 3 at $42.90 (term price) with the understanding that if I am not perfectly satisfied I can return it Express Collect and get my deposit back. If I keep it I will pay $3.00 a month until I have paid the (term price) in full.

☐ Underwood No. 5 ☐ Corona No. 3

Name..... Age....

Address.....

Town.....State.....

Mystery "TWIN-RAY" Light Tested—

SEVERE TEST GIVEN NEW SAFETY LIGHT

June 5th: A demonstration of the new Auto Safety Light, designed for safe night driving, was given at the Boston airport on Friday night before an interested gathering of pilots and automobilists. The first test was the ability to read any part of a newspaper at a point of 1,000 feet in front of the light and a foot above the ground, proving that while the ground in front of the light was perfectly illuminated, the rays from the light were at no point above the center of the light itself. Consequently there would be no glare to an on-coming car, showing the light powerful enough to penetrate the lights of the on-coming car and show clearly the road beyond and any obstacles in it.

Reads Newspaper At 1,000 Feet!



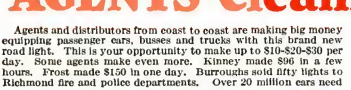
Lights Highway Ahead With 67,000 Candle Power Beam

Reporters for the Boston Sunday Post witnessed a demonstration of this light and above is a reprint of their report.

Now—judge for yourself what you can do with a light like this on your automobile—a light that throws a 67,000 candle power beam, for over 1,000 feet—lights up all road signs and curves long before you reach them. Makes the road ahead of you as bright as day yet absolutely can't glare in the eyes of approaching drivers. A road light that literally takes the light out of the sky—all light on the highway. Fast night driving now safe with this amazing Speedlight—you can drive 50-60—even 70 miles an hour with perfect safety. On a road as brilliantly lighted at midnight as at mid-day. Cuts through fog, rain, and darkness. This "twin-ray" road light not only can't glare itself but it cuts through on-coming brights. No wonder it was awarded the grand prize and two gold medals in world competition.

AGENTS Cleaning Huge Profits

Agents and distributors from coast to coast are making big money equipping passenger cars, busses and trucks with this brand new road light. This is your opportunity to make up to $10-$20-$30 per day. Some agents make even more. Kinney made $96 in a few hours. Frost made $150 in one day. Burroughs sold fifty lights to Richmond fire and police departments. Over 20 million cars need this wonderful light to protect human lives and property against glaring lights, fog, rain and darkness. Hundreds of men have made big fortunes out of makeshift spot lights and painted bulbs that only did half the job. Send the coupon and find out how you can use this great device to build up a crew of your own—and double your earnings—earnings which by themselves will be bigger than you ever saw before. Do it now, before you turn this page.



Cuts Through London Fog and Darkness Like a Knife

Tests in England have proved this. With this light you need have no more fear of fog, rain or darkness. There is no light like it in the world. It is not a spot. It embodies an absolutely new principle in headlighting discovered by a famous light engineer. **NOT A PAINTED BULB**—But a real scientifically constructed road light with a concentrated 67,000 candle power beam of light on the road for over a thousand feet and no glare. Think of it! Over a fifth of a mile. Put one on your car and see for yourself what you can do with a light like this. Send the coupon today for our introductory offer.

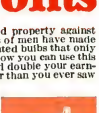
SPEEDLIGHT COMPANY

1731 Belmont Ave., Dept. 10-B, Chicago, Illinois

TO GET THIS LIGHT

FREE of Extra Cost

DON'T TURN PAGE—
MAIL THIS COUPON FIRST



SPEEDLIGHT COMPANY,
1731 Belmont Avenue,
Dept. 10-B, Chicago, Illinois.

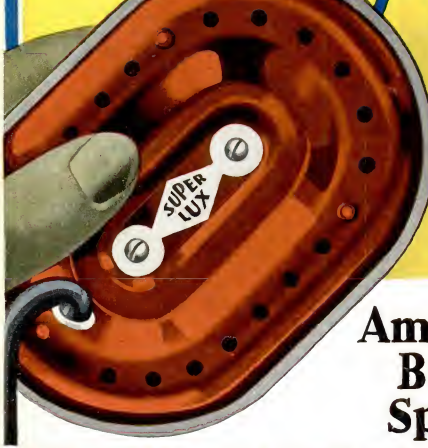
Without obligation to me please send me full details of your Speedlight and your wonderful introductory offer.

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CITY.....STATE.....

ANNOUNCING The NEW DOUBLE ACTION SUPER-LUX!



Amazing Magic Disc Boils Water in Split Seconds!

AND PAYS AGENTS UP TO $20..$30..$40 IN A DAY



AT LAST the good news is out! The new Super-Lux Double-Action Water Heater is ready! Now hot water—boiling, steaming, hot in less time than ever before! Even the amazing 1934 Lux has been surpassed by this new scientific marvel. Five major improvements and many minor refinements put this sensational device absolutely in a class by itself—miles ahead of any similar heater money can buy.

5 Amazing Improvements!

First of all (1) the new Super-Lux sets a new standard for appearance with a flashing crimson outer shell that is useful as well as ornamental. By an exclusive new process, color is actually plated on, becomes a part of the metal and protects it against pitting, scarring and corrosion. (2) An improved cord with extra heavy wires makes overheating impossible and a special insulation that will not soften or crack in hot water. (3) Instead of bronze or copper screws and fittings, the new Lux uses a special alloy that will not corrode or turn green; water heated with it can safely be used for cooking. (4) The heating element, too, is made heavier and of a new material that adds months, even years, to the useful life of the heater.

Most important of all, is (5) the amazing double-action heating principle—an exclusive Super-Lux feature! Makes possible hitherto unobtainable speed and efficiency. Simply drop the new Super-Lux in a pan of water, turn on the current and, almost instantly the water is seething, bubbling, boiling furiously. You simply have to see it in action to realize its volcanic intensity and speed of action. And, remember, the only way to enjoy all these advantages is to own the new Super-Lux. No matter how much or how little hot water you use, you need this amazing invention!

Triples Profits for Agents

Why not investigate today—read what it will do. More important still, look into its astounding money earning power. Learn why men who never made more than $10 or $12 in a day before now reach $20—$30—$40 or more with ease! No experience or special sales ability needed—a simple 60-second demonstration is all it takes, for people know the name LUX—know this company as the pioneer manufacturers of this type of heater—know that the name means quality—service—VALUE! An improved Lux, therefore, all but sells itself! Investigate NOW!

$195.00 IN TEN DAYS



How would you like to make $195 in 10 days? C. L. Neuman (Ind.) has shown that it can be done. Read what he says: "Have sold 156 (made $195) in 10 days. No trouble to sell them!" But Neuman is only one of many who find sensationally big profits amazingly easy to make. Send the coupon below for free proof of extraordinary opportunity.

$41.25 in One Day

Still another sensational achievement. J. Smith (Mo.) earned $41.25 in one day with the Lux Water Heater! Your territory is just as promising as Smith's or any other. So, don't fail to mail that coupon TODAY!

MAIL COUPON TODAY

For Description of the New Super-Lux and amazing proof of sensational big money opportunity!

LUX-VISEL, Inc., Dept. B-60,
Elkhart, Indiana.

Rush me full information about the New Super-Lux and amazing BIG-MONEY opportunity.

Name.....

Address.....

City.....State.....



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